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STRICKLAND (A. H.). **The Arthropod Fauna of some tropical Soils with Notes on the Techniques applicable to entomological Soil Surveys.**—*Trop. Agriculture* **21** no. 6 pp. 107–114, 31 refs. Trinidad, 1944.

The following is substantially the author's summary. A list is given of the most important types of Arthropods that spend a part or all of their life-cycles in the soil, with comments on their direct and indirect importance to the agriculturist and notes on their frequency of occurrence in some tropical soils. Existing techniques for the taking of biological soil samples are summarised, and the various methods available for the extraction of the Arthropod fauna from such samples are discussed.

DAVIDSON (J.). **On the Growth of Insect Populations with successive Generations.**—*Aust. J. exp. Biol. med. Sci.* **22** pt. 2 pp. 95–103, 6 graphs, 8 refs. Adelaide, 1944.

The following is substantially the author's summary. Growth trends in natural populations of *Smynthurus viridis*, L., in a clover pasture in Western Australia and of *Thrips imaginis*, Bagn., on rose in South Australia are discussed, in order to show the relation between the growths of populations of insects with incomplete and complete overlapping of generations. With the latter group, trends in the growth of the population are best represented by a logistic curve ; in some instances the growth trends may be cyclic, because of generation effects or change of conditions in the environment. With the former group the growth of the population exhibits a distinctive upward and downward trend in each generation ; and the course of growth can be represented by combinations of normal or skew distribution curves, which take into account the distribution of hatching and death in each generation. The extent of the overlapping of generations enlarges as the number of consecutive generations increases ; complete overlapping is achieved in fewer generations with those species in which the female lays its eggs, at frequent intervals, over a large part of its adult life. The general trend of the growth of an insect population with overlapping generations can be described by a logistic curve ; but this may not show the trend of the population within the periods of individual generations.

MILLER (L. W.). **Investigations of the Flour Beetles of the Genus *Tribolium*. I. The Incidence of *T. castaneum* (Hbst.) and *T. confusum* (Duv.) in Wheat and Flour in Victoria.**—*J. Dep. Agric. Vict.* **42** pt. 5 pp. 217–219, 221, 6 refs. Melbourne, 1944.

Two species of *Tribolium*, *T. castaneum*, Hbst., and *T. confusum*, Duv., are common in Victoria, and a preliminary survey showed that the former was the dominant species of the genus in bulk wheat and the latter in flour mills. In further examinations of 44 samples of infested wheat from 21 localities and of samples of infested flour from mills in seven, *T. castaneum* was the predominating species in all but two of the wheat samples and was not found in the flour, whereas *T. confusum* was found in all the samples of flour and only seven of the samples of wheat. *T. castaneum* was one of the first of the stored grain pests to be found in any numbers in bulk wheat, and large numbers were frequently observed massing on the surface soon after the wheat was stored and considerably before the development of any noticeable populations of *Calandra oryzae*, L., *C. granaria*, L., or *Rhizopertha dominica*, F., which are usually considered to be the primary pests. Though the flour from mills contained only *T. confusum*, *T. castaneum* was present in the wheat that was being ground in several cases. The evidence indicated that either the grain stream does not constitute an important source of infestation of flour mills by *T. castaneum* where efficient wheat-cleaning plants are in operation, or else that the environment within the

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mills inhibits the development of *T. castaneum* and not that of *T. confusum*. It appears unlikely that temperature is the deciding factor, since it is generally high enough within flour-milling machinery in Victoria to permit active breeding of both species throughout the year.

All mills in Victoria that produce flour for export are fumigated at least once a year, and investigations were carried out to determine the efficiency of commercial fumigation with hydrocyanic acid gas and the source of re-infestation of the mill after it. Treatment was carried out by the pot method, with sodium cyanide and dilute sulphuric acid, and followed the normal commercial practice, except that the dosage was increased from 12 to 16 oz. HCN per 1,000 cu. ft. in an endeavour to obtain the maximum kill; about 1,000 individuals of all stages of *T. confusum* were exposed in different parts of the milling plant for 24 hours at temperatures of 58–88°F. Complete mortality was obtained in most positions, but not in the centrifugal sifters. Owing to the design of these, it was impossible to rid them of small accumulations of infested flour, and the penetration of the fumigant into the inaccessible parts was apparently not sufficient to give a complete kill. There was a low kill of insects within a bag of bran, illustrating the danger of leaving odd bags of infested stock within a mill during a fumigation. Periodic inspections were made after fumigation; small numbers of *T. confusum* were found within eight weeks where incomplete kills of the test insects had been obtained, and some appeared in other places later, but none was found where the grain stream entered, although small numbers of *T. castaneum* were present in the wheat being ground. It is clear, therefore, that the population of *T. confusum* developed from survivors of the fumigation rather than from insects brought in with the grain stream.

It was observed that *Ephestia kuehniella*, Zell., had ceased to be a major pest in most of the flour mills that were fumigated with HCN at least once a year, and it is possible that regular mill fumigations have assisted in eliminating *T. castaneum* while failing to eradicate *T. confusum*.

MUGGERIDGE (J.) & DOLBY (R. M.). **The Use of Dichloroethyl Ether as an Acaricide.**—*N.Z. J. Sci. Tech.* **25** (B) no. 5 pp. 223–225, 6 refs. Wellington, N.Z., 1944.

In the course of an investigation on the control of cheese mites in New Zealand, dichlorethyl ether was found to be very toxic to the common species, *Tyrolichus casei*, Oudm. (*Tyroglyphus siro*, auct.). A concentration of 0·7 mg. per litre or 0·046 lb. per 1,000 cu. ft. space gave 100 per cent. mortality after exposure for 24 hours at 70°F. and 80 per cent. relative humidity, and even traces of dichlorethyl ether appeared to act as a deterrent to the mite. Experiments were therefore carried out to assess its suitability for the treatment of wooden shelving or crates with which cheese comes in contact after it leaves the factory. Pieces of white-pine timber 8½ ins. square and 1 in. thick were used, and the dichlorethyl ether was applied by pouring it into a hole bored in the side of the wood and plugging the hole or by dripping it on the wood so as to wet the upper surface. Infested cheeses were placed on the blocks and these were put on a heavily infested table and kept for 4–5 months at a temperature and relative humidity that varied but did not fall below 54°F. and 70 per cent. The dichlorethyl ether from the holes penetrated the wood and maintained a low concentration of fumigant for a considerable time. A dosage of 10 ml. in the hole or of 3·4 ml. on the surface gave good control and one of 5 ml. in the hole variable control throughout the period of exposure, and it is considered that such treatment of timber touching cheese will provide some immunity from infestation for a considerable period; 1 ml. per hole appeared to be ineffective. A cheese that was kept for six weeks in an atmosphere

saturated with the vapour of dichlorethyl ether showed no foreign flavour in the interior and only slight flavour in the rind, and no foreign flavour could be detected in others that were exposed to the vapour for shorter periods.

WILLE (J. E.). **Experimentos con polvos silícicos.** [Experiments with Siliceous Dusts.]—*Bol. Direcc. Agric. Peru* **16** no. 48–51 pp. 28–39, 15 figs. Lima, 1944.

It was reported from Argentina in 1940 that insect pests of stored grain could be controlled by means of siliceous dusts [*cf. R.A.E.*, A **30** 30; **32** 339], which were stated to act principally by impeding mastication and thus preventing feeding, though they also repelled ovipositing females. Maize and leguminous seeds are sometimes stored in sand on farms in Peru; this is effective, but large amounts of sand are required. Experiments were therefore carried out near Lima in 1942 to test the Argentine results. Maize and wheat of which 5 per cent. of the grains were infested by *Calandra oryzae*, L., and 5 per cent. by *Sitotroga cerealella*, Ol., and maize of which less than 0·5 per cent. of the grains were infested by *C. oryzae*, were placed in petrol tins and treated with amounts of finely ground quartz (quartzite), volcanic ash or pumice dust equal to 2 and 4 per cent. of the weight of the grain. Samples from each tin were examined two and eight months after the beginning of the experiment. It was found that the treatments gave no control of the weevil, which rapidly increased in numbers in all the tins. *Sitotroga* increased somewhat and then died out, probably because of the heating of the grain induced by the weevil. There was no significant difference between the two rates of application for any one dust, and no consistent differences between dusts.

It was further reported from Argentina in 1942 that volcanic ash was effective in the laboratory against pests of crops, including larvae of Lepidoptera and *Caliroa* (*Eriocampoides*) *limacina*, Retz., larvae and adults of Coleoptera, and grasshoppers, and considerably reduced infestations of pears by *C. limacina* and of apples by *Cydia pomonella*, L., when applied as a dust in the orchard to trees that had just been sprayed with water containing a casein adhesive. It was stated to act by perforating the tissues of the digestive tract and impeding the muscles and glands. In an attempt to verify this in Peru, larvae of *Bombyx mori*, L., in the second and third instars, were confined with mulberry leaves heavily dusted with quartz, volcanic ash and pumice dust, but they developed normally and mortality did not exceed that in the controls.

The great divergence in the results obtained in the two countries is attributed to the higher temperature and atmospheric humidity in Lima.

CUSTODIO P. (T.). **El henequén, sisal y otros ágaves similares. Su cultivo, beneficio e industrialización en las Repúblicas de México y El Salvador.** [Henequen, Sisal and similar Species of *Agave*, their Cultivation and industrial Uses in the Republics of Mexico and El Salvador.]—*Bol. Direcc. Agric. Peru* **16** no. 48–51 pp. 41–172, 116 photos., 4 diagrs., 3 figs., 21 refs. Lima, 1944.

This paper includes a brief section (pp. 98–100) on the pests of *Agave fourcroides* (henequen) in Mexico. Some damage is caused by the Dynastid, *Strategus julianus*, Burm., and the weevil, *Scyphophorus acupunctatus*, Gylh., the larvae of both of which bore in the stems of older or weakened plants, causing them to break. The eggs are laid on the bracts of the leaves, and the larvae pupate in their galleries. More serious injury is caused by the Jassid, *Homalodisca triquetra*, F., nymphs and adults of which feed on the young leaves, facilitating the entry of fungi. Swellings arise on infested leaves, and the fibre is damaged. The females deposit their eggs beneath the epidermis of young shaded leaves.

Wille (J. E.) & Garcia Rada (G.). **Cultivos del algodón Sea Island.** [The Cultivation of Sea Island Cotton.]—*Bol. Direcc. Agric. Peru* **16** no. 48–51 pp. 235–236. Lima, 1944.

Plantings of Sea Island cotton in several valleys to the south of Lima were found in 1943 to be in an unhealthy state and infested by *Anomis texana*, Ril., *Mescinia peruella*, Schaus, *Dysdercus ruficollis*, L., *Anthonomus vestitus*, Boh., *Aphis gossypii*, Glov., *Thrips* sp., *Empoasca* sp., *Dikraneura* sp. and *Tetranychus peruviensis*, McG.* The poor condition of the plants was thought to be due to climate rather than to the infestation, but it was observed that the last five pests were much less numerous on neighbouring plantations of Peruvian varieties, which have hairy leaves.

De Santis (L.). **Nota sobre un Curculionoideo "picudo" poco conocido.** [Notes on a little known Weevil.]—*An. rur. Prov. B. Aires* **12** pp. 252–255, 7 figs., 5 refs. Buenos Aires, 1944; also in *Dagi* **2** no. 6 pp. 11–14. La Plata, 1944.

Adults of *Apion simplex*, Beguin-Billecocq, which was described from the Province of Buenos Aires, have recently been observed there on unripe apples. Their presence has coincided with the dropping of considerable numbers of fruits. In some fallen apples from La Plata examined in January 1942, the weevils were found sheltering in the peduncular cavities, but it is not known whether they were the immediate cause of the drop. Some were observed sheltering in the nests of *Oiketicus kirbyi*, Guild. *A. simplex*, of which the adult is described, has not so far been considered of economic importance, and nothing is known of its life-history or immature stages. A list is given of other little known species of *Apion* that occur in Argentina.

Weevils found in April 1942 on fallen apples in the delta of the Parana were identified as *Calandra oryzae*, L. (*Calendra zea-mais*, Motsch.). It is not known whether this pest of stored grain is injurious to apples.

De Santis (L.). **Sobre un nuevo Afelinido argentino (Hym., Chalcidoidea).**—*Notas Mus. La Plata* **5** Zool. no. 30 pp. 23–29, 6 figs., 2 refs. Buenos Aires, 1940. [Recd. 1945.]

Prophyscus latiscapus, gen. et sp. n., is described from males reared from *Quadraspidiotus* (*Comstockaspis*) *perniciosus*, Comst., on plum. It is the fourth Aphelinid recorded as a parasite of this scale in Argentina [*cf. R.A.E.*, A **27** 24].

Hayward (K. J.). **La cochinilla blanca de los cítricos (*Unaspis citri* (Comstock)) en Tucumán.** [The White Citrus Scale (*U. citri*) in Tucumán.]—*Circ. Estac. exp. agríc. Tucumán* no. 124, 13 pp., 8 figs. Tucumán, 1944.

Citrus trees, especially cumquats, in the Province of Tucumán, Argentina, have of recent years been severely attacked by *Unaspis citri*, Comst., which was declared a national pest in 1938, so that control measures are compulsory. Infestation may occur on any of the aerial parts of the tree, but usually begins on the trunk at ground level and spreads upwards, finally reaching the leaves and fruits. The bark becomes rough and splits longitudinally, affording entrance to fungi, the leaves drop and the parts attacked, or in cases of severe injury whole trees, die. The male and female scales are described, and characters

* We are informed by Dr. E. A. McGregor that he does not know of any mite having been described as *Tetranychus peruviensis*. The species in question is possibly one that he described as *T. peruvianus* in 1917 [*R.A.E.*, A **5** 167] and subsequently transferred to the genus *Paratetranychus*.—*Ed.*

are given distinguishing them from those of *Pinnaspis aspidistrae*, Sign., which occurs only on the leaves, and the females from those of *Lepidosaphes* (*Mytilococcus*) *beckii*, Newm.

U. citri is ovoviviparous and has four generations a year, or five if the winter is warm. The males, which are more numerous than the females, complete their development in five or six weeks. The females develop to the reproductive stage in about nine weeks and then produce their young for about six weeks, so that all stages are present together. Wet weather is unfavourable to development. The Coccinellids predacious on this Coccid in Argentina are *Cryptognatha signata*, Korsch., which is common on the Uruguay and Paraná rivers, and *Pentilia egena*, Muls., which occurs in various parts of the north and in Brazil. The latter was liberated in Tucumán in 1935, but was not recovered. *Aspidiotiphagus lounsburyi*, Berl. & Paoli, was bred in small numbers from *U. citri* in the region known as the Littoral and is apparently its only parasite in Argentina.

Control in Tucumán is difficult because the temperature is too high during most of the year for insecticides to be applied at adequate concentrations. Lime-sulphur (32°Bé) is effective at a concentration of at least 4 per cent., but this frequently scorches the leaves and fruit. It has a certain effect at lower concentrations, but a second application should then be made after 15–20 days. It can be applied with a brush to the trunks and branches to prevent the spread of infestation. Good results are given by miscible white oils applied at concentrations of 2–2·5 per cent. to the trunks and inner branches or at 1·5–2·5 per cent. to the whole tree, provided that they are delivered at a rate of at least 3·3 gals. per minute and at a pressure of at least 150 lb. In cases of severe attack, it is advisable to make a preliminary application to the trunks and branches and to spray the whole tree 15–20 days later. A third application is sometimes necessary. Spraying should begin as soon as infestation is noticed, though it is most effective in spring, and the concentration should be as high as the temperature will permit. The amount of spray applied should be generous unless the tree has been scraped, since the crust of dead scales absorbs much of it.

HAYWARD (K. J.). **Contribución a la bibliografia del pulgón amarillo de la caña de azúcar** (*Sipha flava* (**Forbes**)). [Contribution to the Bibliography of the Yellow Sugar-cane Aphid (*S. flava*).]—*Publ. misc. Estac. exp. agríc. Tucumán* no. 3, 13 pp. Tucumán, 1944. **El pulgón amarillo de la caña de azúcar** (*Sipha flava* (**Forbes**)) **en Tucumán.** [The Yellow Sugar-cane Aphid (*S. flava*) in Tucumán.]—*Circ. Estac. exp. agríc. Tucumán* no. 125, 8 pp., 3 figs., 8 refs. Tucumán, 1944.

The bibliography contains the titles of over 100 papers dealing with *Sipha flava*, Forbes, arranged alphabetically under authors and followed in most cases by brief statements of their contents. In the second paper, the author states that *S. flava* is a minor pest of sugar-cane in Argentina and gives notes on its distribution and food-plants. In the Province of Tucumán, it has been found only on sugar-cane. It congregates on the lower surfaces of the outside leaves, which become discoloured, but does little damage and is much less injurious than in British Guiana, where it may kill plant cane. Viviparous parthenogenetic reproduction continues throughout the year in regions with warm winters, but the sexual forms and winter eggs are produced in those in which low temperatures occur. The duration of development depends on temperature and may be as short as 8 days, and the Aphids may survive for up to 100 days, though 50 is more usual. A parthenogenetic female produces about 60 progeny. In Tucumán, *S. flava* is active in cane-fields from mid-December until harvest, unless heavy frosts intervene. It is usually kept under control by predacious Coccinellids, chiefly *Cycloneda sanguinea*, L., and *Scymnus* spp.

HAYWARD (K. J.). **Las moscas de las frutas en Tucumán.** [Fruit-flies in Tucumán.]—*Circ. Estac. exp. agríc. Tucumán* no. 126, 10 pp., 7 figs. Tucumán, 1944.

Fruit-flies were declared a national pest in Argentina in 1937, so that measures for their control are compulsory there. Of those that occur in Tucumán, the most injurious are species of *Anastrepha*, especially *A. fraterculus*, Wied., which constitutes 90 per cent. of the fruit-flies taken in traps in orchards. *Ceratitis capitata*, Wied., does not occur in the Province. All varieties of fruit are attacked, and sometimes even vegetables and nuts. In *Citrus* fruits, many of the eggs and larvae are destroyed by the essential oils in the rind. Brief notes are given on the habits of fruit-flies and on the appearance of infested fruits. Development lasts about 25 days in hot weather and longer in cold.

Effective control of fruit-flies can only be obtained by a combination of methods carried out in all the orchards of a district. Those recommended are the use of trap-glasses and baits, bait-sprays, the destruction of infested fruits and the liberation of parasites. Trap-glasses serve to indicate the presence of fruit-flies and afford some control if sufficiently numerous, but for this there must be 2–3 to every tree. The bait recommended for general use is wine vinegar and water (1 : 3), but *Anastrepha* spp. are also attracted by black beer and water (1 : 1), molasses and water (1 : 12) or the juice of *Citrus* fruits, including the essential oils, and particularly by a mixture of 3 lb. wheat bran, 1 lb. molasses, 0·1 lb. sodium hydrogen arsenate and 5 gals. water. The last three baits should be kept for a week before use to permit fermentation. If a bait is exposed in open containers, it should be poisoned with 0·15 per cent. sodium fluoride, sodium fluosilicate or sodium arsenite. The flies are also attracted by bundles of grass or straw dipped in a mixture of molasses and water (7 : 50) containing about 0·3 per cent. of one of the above poisons. The baits or traps should be suspended at a height of about 4–5 ft. above the ground in the outer part of the tree, and the liquid renewed every week, except in the case of the mixture of molasses and water, which lasts for two months.

The bait-spray recommended contains 5 per cent. molasses and 1·5 per cent. sodium fluosilicate or sodium fluoride. It should be applied very lightly to the trees once a week, but not to branches bearing fruit. In large orchards, it is sufficient to apply it to selected trees or to other plants in the vicinity. Treatment should begin while the fruits are still unripe. Observations have shown that the sprays and baits do not poison honey-bees, provided that they are not applied during the blossoming period and water is available from other sources.

Infested fruits should be collected daily and buried every 10–15 days beneath a well-compressed layer of soil at least 20 ins. thick, or placed in pits covered with a special lid that can be used 20 days later to cover another pit. Fruit-flies are attacked by eight species of Hymenopterous parasites in Tucumán, but only two are of much value. These are distributed annually to interested growers. Other measures of use for small numbers of trees are enclosing the fruits in bags of muslin or other thin material and allowing fowls access to the ground, where they will destroy the larvae as they leave the fruits.

OCCHIONI (P.). **De raiz de *Tephrosia toxicaria* Pers. e do seu aproveitamento no combate ao *Tenthecoris bicolor* Scott.** [The Root of *T. toxicaria* and its Use for the Control of *T. bicolor*.]—*Rodriguésia* **7** no. 16 pp. 55–61, 5 pls., 5 refs. Rio de Janeiro, 1944.

Tenthecoris bicolor, Scott, is a common pest of cultivated orchids in Brazil [*cf. R.A.E.*, A **31** 414]. The nymphs and adults feed on the tender leaves and the floral spathes, and inject a toxin into the plant that causes the tissues to turn yellow and then black. Infested plants drop their leaves, do not flower,

and die in a few years if the attack continues. As this Capsid is difficult to control, an experiment was carried out to test the effect on it of an extract of the roots of *Tephrosia toxicaria*. This plant grows wild and is also cultivated in Brazil, and its roots contain rotenone. The structure of the root and the general appearance of the plant are described. The extract was prepared by adding a little alcohol at 50°C. [122°F.] to coarsely ground air-dried root taken from cultivated plants after flowering, keeping it at this temperature in a water-bath for an hour, allowing it to stand for 24 hours, and then adding water at the rate of 1 pint per 2 oz. root, stirring and filtering through cotton. The resulting liquid was applied as a spray to infested orchids in an orchid house. All the nymphs died in 3–10 minutes, but some of the adults, which are active and fly readily, escaped from the spray. Those with which it came into contact died in 15–40 minutes.

MacGill (E. I.). **On the Biology of *Dysdercus howardi*, Ballou. III. The Effect of Temperature and Humidity on the Life-cycle.**—*Bull. ent. Res.* **35** pt. 4 pp. 301–308, 2 figs., 12 refs. London, 1945.

The following is substantially the author's summary of this paper which belongs to a series [*cf. R.A.E.*, A **23** 498 ; **30** 295]. Experiments were made to find the effect of temperature and relative humidity on the biology of *Dysdercus howardi*, Ballou. The optimum temperature for the survival and incubation of the eggs in a saturated atmosphere was approximately 27°C. [80·6°F.]. The temperature range for their development was 19–32°C. [66·2–89·6°F.]. Relative humidities of 75 per cent. and higher gave suitable conditions ; 30 per cent. relative humidity was lethal to the eggs. Their threshold of development is considerably lower than the lowest temperature at which they will hatch. The range of temperature appears to be wider and the threshold of development lower at 82 and 75 than at 100 per cent. relative humidity. There is a correlation between the degree of absolute humidity and the incubation period. The length of the life-cycle is approximately twice as long at 20°C. [68°F.] as at 27°C. The optimum temperature for the survival of nymphs to reach the adult stage is nearer 27° than 20°C.

Hinton (H. E.). **The Histeridae associated with Stored Products.**—*Bull. ent. Res.* **35** pt. 4 pp. 309–340, 56 figs., 41 refs. London, 1945.

Keys are given to the adults of the 14 Histerids that have been found in stored food or in warehouses and other buildings used for the storage of dry animal or vegetable products in various parts of the world, and to the larvae of some of them. The adults of ten of the species are described, with brief notes on their distribution and habits ; the other four species appear to be only accidentally associated with stored products. Notes on the general characters of Histerid larvae and adults and on their bionomics are also included. They must be regarded as beneficial insects in view of their exclusively predacious habits, but the author considers that they are probably seldom if ever of any real importance in the destruction of mites or insects associated with stored products.

Manton (S. M.). **The Larvae of the Ptinidae associated with Stored Products. With an Introduction by H. E. Hinton.**—*Bull. ent. Res.* **35** pt. 4 pp. 341–351, 7 pls., 1 fig., 2 refs. London, 1945.

A key is given to the mature or almost mature larvae of 12 of the 15 Ptinids that have been recorded in association with stored products in the British Isles. They include all those of any importance in Britain and, with a few exceptions, elsewhere. The characters used in the key are explained, the inter-generic and

inter-specific differences are discussed, and characters common to the larvae of the 12 species are summarised. The introduction includes a key separating Ptinid larvae from those of three related families.

LEVER (R. J. A. W.). **Insect Pests of some Economic Crops in Fiji.**—*Bull. ent. Res.* **35** pt. 4 pp. 367–377, 7 refs. London, 1945.

Lists are given of insects that attack cultivated plants and noxious weeds in Fiji, and of those that damage stored products and miscellaneous materials, including books and papers, clothing, and dressed timber. They are arranged under plants or products, and the parts of the plants attacked by the various pests are shown.

ANDREWARTHA (H. G.). **Some Differences in the Physiology and Ecology of Locusts and Grasshoppers.**—*Bull. ent. Res.* **35** pt. 4 pp. 379–389, 47 refs. London, 1945.

It has been suggested [*R.A.E.*, A **17** 2] that injurious species of Acridids should be referred to as locusts if they exhibit a tendency for the nymphs and adults to become gregarious as the population density increases and to undertake organised mass migrations, and as grasshoppers if they are not gregarious or migratory. After a review of the recent literature on the subject, the author suggests that the two groups should be differentiated by their physiology and ecology rather than by their behaviour. On this basis, the term locusts would apply to species with the following characters: the distribution of solitary individuals and of " plagues " during outbreaks extends over very wide areas with diverse climates; plagues originate in " outbreak areas," which are often more arid than the " invasion area "; the development of plagues in the outbreak area is favoured by a cycle of years with the rainfall above the average; there is no true diapause in any stage, and with favourable weather there may be several generations in a year; and development, particularly of nymphs and adults, may be inhibited by dryness. The species to be called grasshoppers have the following characters: plagues are restricted to well-defined relatively narrow climatic zones; there is no clear distinction between outbreak area and invasion area, the species maintaining a relatively high population throughout the area subject to plagues and the plagues developing when the weather favours the multiplication of individuals already in the area; plagues usually develop during a cycle of years with sub-normal rainfall; there is an obligatory diapause in the egg stage, and only one generation in one year is produced; and the length of life and fertility of adults may be reduced by inadequate food during a dry period, but there is no evidence of low atmospheric humidity inhibiting development.

The egg-diapause is discussed and its phylogeny traced from the primitive condition in locusts, through an intermediate condition in such grasshoppers as *Melanoplus mexicanus*, Sauss., to the highly specialised conditions in the grasshoppers of the type of *Austroicetes cruciata*, Sauss.

ROONWAL (M. L.). **New Hypotheses for Prediction of the Swarming of the Desert Locust.**—*Bull. ent. Res.* **35** pt. 4 pp. 391–393, 8 refs. London, 1945.

Adults of the gregarious phase of *Schistocerca gregaria*, Forsk., are known to possess six eye-stripes, while those of the ph. *solitaria* usually have seven [*R.A.E.*, A **25** 390]. From an analysis of the available statistical data from India, the author concludes that a locust population may be considered on its way towards the acquisition of ph. *gregaria* characters if examination of a sufficiently large sample shows that more than 80 per cent. of the individuals have six stripes, or that the percentage of males among the six-striped

individuals is not much greater than 50, or that the proportion of six-striped individuals is materially above 82 per cent. in males and 60 per cent. in females.

Campbell (G. A.) & West (T. F.). **DDT, the new Insecticide. A general Survey and some possible Paint Applications.**—*J. Oil Col. Chem. Ass.* **27** no. 294 pp. 241–262, 20 figs., 3 refs. Slough, 1944.

The first part of this paper consists of descriptions of the research that resulted in the discovery of the insecticidal properties of αα-dichlor-diphenyl-βββ-trichlorethane [2, 2-bis (parachlorphenyl)-1,1,1-trichlorethane], commonly known as DDT, and the second, which is noticed elsewhere [*R.A.E.*, B **33** 76], is an account of investigations on the use of DDT in paints against the house-fly [*Musca domestica*, L.]. The authors give details of the original investigations on moth-proofing agents, and show the types of molecular structure that were found to be associated with toxicity to clothes moths and an affinity for wool fibre. They then describe later studies in which a wider range of substances was investigated on other insects, comparing formulae of effective and ineffective synthetic organic stomach poisons, and a biological analysis of the process of contact poisoning, which suggested that a contact insecticide that does not act through the tracheal system must be lipoid-soluble. This led to the preparation of DDT, which showed an insecticidal effect not previously observed in a synthetic substance. The molecular structures of a number of compounds related to DDT are shown, with information on their effectiveness as contact insecticides for houseflies, and the method of action of DDT is discussed. It is considered that the DDT molecule provides an example of internal synergism in which the lipoid-solubility of the chloroform residue increases the effectiveness of the *p*, *p'*-dichlor-diphenyl condensate.

Baker (M. R.). **Review of the Japanese Beetle Situation in Canada.**—*74th Rep. ent. Soc. Ont. 1943* pp. 7–8. Toronto, 1944.

A brief survey is given of the precautions taken to defer the entry of the Japanese beetle [*Popillia japonica*, Newm.] into Canada [*cf. R.A.E.*, A **28** 419] and the control measures carried out against it in southern Ontario in 1941–43 [*cf.* **31** 127, 456]. Infestations were found there in each of the three years, and some 64 tons of lead arsenate were applied to about 253 acres of ground in infested areas. In 1942, 7,118 traps were used between Windsor, Ontario, and Yarmouth, Nova Scotia, and 826 beetles were caught in them, 616 at Windsor, 157 at Niagara Falls, and the others at 11 other places in Ontario and two in Quebec. In 1943, about 7,300 traps were put in 44 localities between Windsor and Montreal, and 151 beetles were caught at 16 places in Ontario and three in Quebec. Although the cool, wet weather of 1943 certainly reduced beetle flight, the marked reduction of populations in the infested districts is attributed largely to soil treatment. Beetles taken in untreated localities included a number of single individuals trapped near railway sidings, indicating that they had escaped from loads of plant products imported from the United States, and 29 beetles were found alive in potatoes from Virginia, 11 at Toronto and 18 at Montreal. Two others were found in aeroplanes at an airport near Montreal.

Thompson (R. W.). **The European Corn Borer Situation in Ontario in 1943.**—*74th Rep. ent. Soc. Ont. 1943* pp. 9–10. Toronto, 1944.

The percentage of maize stalks infested by the European corn borer [*Pyrausta nubilalis*, Hb.] in Ontario was significantly higher in 1943 than in 1942 [*cf. R.A.E.*, A **31** 457], mainly owing to weather conditions in autumn and spring, which were favourable for the borer and prevented the satisfactory disposal of

maize refuse. Nevertheless, there was not so much damage to the crop as was anticipated, because the wet weather retarded the planting of maize in all but a few localities in each county. The moths were limited to a much smaller number of fields than usual, and this resulted in a concentration of infestation in earlier plantings of both sweet and field maize ; these had many larvae in the cobs and were severely damaged, but the main crops were not badly affected. The average percentages of stem infestation in different counties in each year from 1939 to 1943 are shown in a table.

DUNCAN (J.). **Factors affecting the Increase in Population of the Corn Borer, *Pyrausta nubilalis* Hbn., in 1943.**—*74th Rep. ent. Soc. Ont. 1943* pp. 10–11. Toronto, 1944.

The average degree of infestation of maize by *Pyrausta nubilalis*, Hb., in Quebec increased from 6·3 per cent. in 1942 to 18·8 per cent. in 1943. The causes of this include the cold and rainy spring weather, which delayed the upward movement of the larvae that had been ploughed under during the previous autumn, so that 10 per cent. of them had not reached the surface of the soil by the end of June and a rather high percentage probably escaped the cleaning-up measures employed for their control, and shortage of labour which, with unsatisfactory weather conditions [*cf.* preceding abstract], rendered the cleaning-up measures less effective than usual. The heavy snow and continued cold weather of the winter provided favourable overwintering conditions, so that winter mortality was only 7·5 per cent. as compared with 60 per cent. the previous year ; and parasitism by the native Ichneumonid, *Labrorhycus prismaticus*, Nort., fell from 6 to 2·5 per cent. The bad weather resulted in late sowing and the emergence of adults at the beginning of July instead of in the first two weeks of June, and, in consequence, early maize was badly damaged. The intensity of infestation was also increased by the decrease in the area sown with maize. Adults were in flight until 5th September and oviposition extended over six weeks instead of from two to three, which contributed to the scattering of infestation on fields sown at a later date. The percentage of females was 54·6, as compared with 37·8 in 1942, and they deposited an average of 8·5 egg masses containing a total of 145 eggs as compared with 4 masses totalling 80 eggs.

WISHART (G.). **An Increase in the multiple Generation of the European Corn Borer in Ontario and its Relation to Parasite Establishment.**—*74th Rep. ent. Soc. Ont. 1943* pp. 11–13, 5 refs. Toronto, 1944.

Data obtained along the shore of the Detroit River and Lake Erie in Essex County, Ontario, indicated that the partial second generation of *Pyrausta nubilalis*, Hb., on maize is increasing in size to such an extent as to indicate that its production is not solely the result of long, warm summers, but may be the expression of hereditary or other factors [*cf.* *R.A.E.*, A **31** 128, 457]. The hereditary factor would be one that would permit development without an obligatory diapause, and the fact that small numbers of pupating larvae have been found regularly in south-western Ontario and as far east as Belleville in warm summers indicates that a tendency to continuous development has always been present in a very small proportion of the population. The increase in this proportion in south-western Ontario is probably due to the fact that climatic and crop conditions are more favourable to the maturing of larvae of the multiple-generation strain in this area than in the others in which the borer is abundant. It was found that an average of 19·03 per cent. of the larvae from Essex County and only 1 per cent. of those from the Belleville area had the tendency to continuous development. Ample evidence was obtained that eggs

were being laid throughout the greater part of the summer of 1943, and if this condition continues, the comparative immunity from attack of late planted maize may cease.

Lydella grisescens, R.-D. [the introduced Tachinid also known as *Ceromasia senilis*, Mg.] is showing most promise in the area in which there is most evidence of the development of more than one generation of the host [*cf.* **31** 457]; this may be partly because larvae of the two-generation strains are available for parasitism earlier in the season [*cf.* **27** 414], as flies from the overwintered generation usually emerge before the host pupates and many do not survive long enough to find host larvae. Moreover the Tachinid has two generations a year, of which the second must develop on a few late larvae where there is only one generation of the host, whereas there is an abundant supply of suitable larvae where there is a second.

Beall (G.). **Multiple Generation** *Pyrausta nubilalis* **Hubn. on Plants other than Corn in Ontario.**—*74th Rep. ent. Soc. Ont. 1943* pp. 13–15, 2 refs. Toronto, 1944.

During 1943, infestation by *Pyrausta nubilalis*, Hb., of plants other than maize, was frequently reported in south-western Ontario. Such infestation is unusual there and is characteristic of the multiple-generation New England strain rather than the single-generation Ontario strain. The plants attacked included potato, soy bean, late cabbage and a number of weeds, and rearing records showed that larvae collected from the first two were all of a two-generation strain. Another unusual feature in the behaviour of *P. nubilalis* in 1943 was that the adults flew rather freely in the day-time.

Wressell (H. B.). **A Comparison of Derris and fixed Nicotine in controlling the European Corn Borer by spraying in Sweet Corn.**—*74th Rep. ent. Soc. Ont. 1943* pp. 15–18, 4 refs. Toronto, 1944.

The results are given of an experiment carried out in Ontario to compare the control of the European corn borer [*Pyrausta nubilalis*, Hb.] in sweet maize given by sprays of 2 lb. derris (4 per cent. rotenone) per 40 gals. water and of 6 lb., 4 lb. and 2 lb. 11 oz. of a commercial fixed nicotine (5 per cent. nicotine) per 40 gals., under commercial conditions. A spreader containing sodium lauryl sulphate was used with the derris. The sprays were applied at approximately 120 gals. per acre three times at intervals of five days from 13th July, and the ears were picked on 19th and 26th August. The percentages of un-uninfested ears were 86·5 from the plots sprayed with derris, 80, 74·5 and 73·5 from those treated with the three nicotine sprays and 73·5 from untreated plots; statistical analysis showed that the control given by derris was highly significant and that from the highest concentration of nicotine not clearly significant.

Doyle (J. A.). **The Mexican Bean Beetle,** *Epilachna varivestis* **Muls., in Quebec.**—*74th Rep. ent. Soc. Ont. 1943* pp. 18–19. Toronto, 1944.

Epilachna varivestis, Muls., has recently been found in Quebec in parishes bordering the States of New York and Vermont, and 75 of about 1,200 bean fields and gardens situated some 8–10 miles inside the border were found to be infested. In view of the importance of the pest, it was decided to burn all fields of infested beans, and an oil burner that was built for this purpose is briefly

described. This machine, which was operated by two men and directed jets of flame on to the plants and soil under a hood, used about 6–7 gals. of oil per hour and could treat an acre of beans in four hours under favourable conditions.

ARNOTT (D. A.), WOOD (A. A.), WRESSELL (H. B.), GOBLE (H. W.) & CHAPMAN (R. K.). **Further Investigations on the Value of Molasses-free Baits for Control of Cutworms in Tobacco Fields.**—*74th Rep. ent. Soc. Ont. 1943* pp. 19-23, 9 refs. Toronto, 1944.

Experiments with baits for the control of cutworms in tobacco fields in Ontario [*cf. R.A.E.*, A **31** 458] were continued in 1943. Bait mixtures used to compare conditioning agents, poisons and carriers, respectively, were applied on the evenings of 2nd, 3rd and 4th June, all at the rate of 20 lb. dry carrier per acre, and tobacco was planted six days later. A table shows the percentage plant injury one, two and three weeks after planting and the percentage reduction in injury three weeks after planting, for each bait mixture. The effectiveness of the standard bait of 1 lb. Paris green, 25 lb. bran and 2½ gals. water was not increased by the addition of soy-bean flour, calcium chloride or salt or by the substitution of ½ gal. lubricating oil for the water. Of the poisons tested, sodium fluosilicate, cryolite, ammonium magnesium arsenate and Paris green, which were used at 1, 1½, 1 and 1 lb. per 25 lb. bran and 2½ gals. water, reduced injury by 94, 92, 90 and 89 per cent., respectively; white arsenic (9 oz.) and sodium arsenite (15 oz.) were less effective, and calcium arsenite (1 lb.) gave only 71 per cent. reduction of injury. In baits consisting of 1 lb. Paris green and 2½ gals. water in 25 lb. carrier, bran was the best carrier, resulting in 100 per cent. reduction of injury; freshly chopped sweet clover and rolled rye resulted in 90 and 84 per cent., respectively, and distillers' grain, maize cobs and a commercial stock food were ineffective.

HAMMOND (G. H.). **The Feeding Habits of *Phyllophaga* Larvae.**—*74th Rep. ent. Soc. Ont. 1943* pp. 23–26. Toronto, 1944.

The author gives evidence obtained from dissections that larvae of *Lachnosterna* (*Phyllophaga*) and species of related genera discriminate between roots and soil in normal feeding and avoid the latter. They usually feed at a depth of 1–2 inches, and second-year grubs may progress for 100 ft. or more during the season. They are omnivorous feeders and can cut through all but the largest and toughest roots, so that a very wide range of agricultural crops is subject to attack; even such resistant crops as lucerne and sweet clover [*Melilotus*] are readily killed when in the seedling stage.

In eastern Canada, where the species of *Lachnosterna* have a three-year cycle of development [*cf. R.A.E.*, A **29** 89, etc.], the first-year larvae feed principally in August and September and cause only minor damage to crops. In the second year, the larvae feed from late April or early May until late September, and in the third, less than a quarter of those present feed, and these only from about the middle of May to the middle of June, the others having completed feeding in the second year. The damage is therefore done mainly by second-year larvae.

Plant re-establishment begins towards the end of the second summer, when feeding slows down, and continues during the following summer. The biennial and perennial plants often make the more certain recovery, but annual weeds are first to appear over areas where grass has been killed and they may spread considerably in a short period; it is therefore important that land where there has been serious damage should be given immediate attention to prevent the wholesale spread of noxious weeds and to avoid natural crop reduction in pasture and meadow. Further, the secondary damage, consisting of soil erosion or leaching, soil drifting, noxious-weed succession and reduced pasture yields,

which may occur for two or more years after the primary damage, is much more important than is generally realised, particularly in farming districts where rotations are neglected.

GAUTHIER (G.). **White Grub Control.**—*74th Rep. ent. Soc. Ont. 1943* p. 26. Toronto, 1944.

Investigations in Quebec showed that the cells in which the larvae of *Lachnosterna* (*Phyllophaga*) *anxia*, Lec., pupate are not more than eight inches below the surface of the soil. Studies on control methods [*cf. R.A.E.*, A **29** 90] showed that chemical measures were not practicable against either larvae or adults. Light-traps caught large numbers of adults, but 95 per cent. of these were males. Suitable crop rotations gave some control and may be effective against light infestations, but are not adequate in highly infested soils. Ploughing followed by cultivation two or three times with a disk harrow considerably reduced the numbers of larvae, and pigs were efficient predators of this stage [*cf.* **25** 368]. Deep ploughing followed by two cultivations with a disk harrow in July, when the pupae are present, was found to be the most effective control method for this species in Quebec.

PERRON (J. P.). **Feeding of Pea Moth Larvae,** *Laspeyresia nigricana* **(Steph.), within the Stems and Flower Buds of cultivated Peas.**—*74th Rep. ent. Soc. Ont. 1943* pp. 27–28, 2 figs. Toronto, 1944.

In studies carried out on the Gaspé coast of Quebec, peas were planted in the spring of 1940 in field cages in which cocoons of *Cydia* (*Laspeyresia*) *nigricana*, Steph., had overwintered. Moths emerged before there were any pods on the plants and the resulting larvae were observed to travel to the flower buds, bore into them and start feeding inside. This resulted in distorted and sometimes severely injured pods. The larvae also entered the pea stems and fed within them, and half-grown larvae found wandering about the plants later in the season may have been driven from the stems as the latter ripened and hardened. The growth and development of these larvae appeared to be affected to some extent by this method of existence. Emergence of some adults before the blooming of cultivated peas has frequently been observed in the field.

BAKER (A. D.). **The History and Distribution of the Pea Moth,** *Laspeyresia nigricana* **(Steph.), in Canada.**—*74th Rep. ent. Soc. Ont. 1943* pp. 29–40, 5 maps, 48 refs. Toronto, 1944.

The following is substantially the author's summary. The earliest records of the pea moth, *Cydia* (*Laspeyresia*) *nigricana*, Steph., in Canada indicate that it was already rather widely distributed in the eastern Provinces at that time. It has probably been present in Canada for at least a hundred years. The available records of its distribution there are given, and these cover all Provinces except Saskatchewan. Where it has become well established, its abundance and the degree of injury it causes may fluctuate greatly over a period of years. Its spread may possibly have progressed from east to west, where it appears to have followed a path on both sides of the boundary between Canada and the United States. The pattern of its distribution and regional prevalence on the Gaspé Coast is given.

MCNALLY (A. G.). **Molasses-free Bait for Earwigs.**—*74th Rep. ent. Soc. Ont. 1943* pp. 41–42. Toronto, 1944.

In small-cage experiments carried out in 1942 and 1943 in an attempt to obtain a bait for *Forficula auricularia*, L., that did not contain molasses, one of 12 oz.

sodium fluoride, 12 lb. bran, 2 U.S. quarts molasses and 6 U.S. quarts water, which has been successfully used in Ontario and is called the Oregon bait [but *cf. R.A.E.*, A **16** 105 ; **29** 304], caused an average mortality of 56·11 per cent. in 15 tests, and the same formula without molasses 54·1 per cent. in 14 tests. When white arsenic was substituted for sodium fluoride in the first bait, only 25 per cent. mortality was obtained, and baits of bran or wheat distiller's grain, white arsenic and water and of wheat distiller's grain, sodium fluoride and water gave less than 10 per cent. ; all these were therefore discarded after initial tests.

Monro (H. A. U.), Briand (L. J.), Delisle (R.) & Smith (C. C.). **Some Experiments with the Pyrethrum Aerosol under Canadian Conditions.**—*74th Rep. ent. Soc. Ont. 1943* pp. 42–45, 3 refs. Toronto, 1944.

The results are given of experiments in Canada in 1943 on the control of insects with an aerosol consisting of 5 per cent. pyrethrum extract containing 20 per cent. pyrethrins, 2 per cent. sesame oil and 93 per cent. dichlordifluoromethane. The aerosol was usually dispersed from a five-pound storage cylinder through a steel capillary tube five inches long with an internal diameter of 0·017 inches [*cf. R.A.E.*, B **32** 99], soldered on an oil-burner nozzle. The nozzle was intended only to hold the tube, but its wire filter helped to prevent clogging. Hypodermic needles of various internal diameters and lengths mounted directly on to the cylinders were also used with success.

In tests carried out in collaboration with J. B. Maltais in mushroom houses in Quebec with a temperature of 52–55°F., commercial control of *Sciara* sp., comparable with that obtained by routine application of a pyrethrum dust, was effected by 0·5 oz. aerosol per 1,000 cu. ft. dispersed with an oil-burner nozzle, the ventilators remaining closed for two hours after treatment. There was no odour at the end of this period and the mushrooms were not affected. The cost was greater than that of treatment with the dust. Larvae of *Pristiphora geniculata*, Htg., on mountain ash [*Sorbus aucuparia*] were very susceptible to small amounts of the aerosol. In one test in Quebec, 0·66 oz. aerosol projected into an uncovered tree, 15 feet high, in 40 seconds in still air caused all the larvae to fall and die. The foliage was not damaged. It is suggested that this method might be used in making population studies of moths, leafhoppers and other insects that do not drop to the ground when trees are shaken.

Keenan (W. N.). **Pear Psylla Control in British Columbia as an international Project.**—*74th Rep. ent. Soc. Ont. 1943* pp. 45–46. Toronto, 1944.

A brief account is given of co-operation between government organisations in the United States and Canada in the surveys that resulted in the discovery of the pear psylla, *Psylla pyricola*, Först., in British Columbia in 1942 [*R.A.E.*, A **31** 320] and in a spraying campaign against it in 1943, when some additional orchards were found to be infested. Three sprays of ¾ pint nicotine sulphate per 100 gals. water, with 1 gal. summer-oil emulsion in the first two and 1 quart fish oil in the third, were applied in all pear orchards in the Okanagan Valley as far north as Oliver and at Okanagan Falls, Koleden and Penticton.

Graham (A. R.). **The Establishment of some imported Parasites of the Larch Casebearer, *Haploptilia laricella* Hbn., in Ontario.**—*74th Rep. ent. Soc. Ont. 1943* pp. 48–52, 1 ref. Toronto, 1944.

Coleophora (*Haploptilia*) *laricella*, Hb., attacks several species of larch (*Larix*) in Canada and has one generation a year. Its life-cycle in the Belleville district of Ontario, which is briefly described, is similar to that recorded elsewhere [*R.A.E.*, A **31** 123], except that the egg stage was observed to last for up to a month. Many native parasites have been reared from it since 1931,

but they have not occurred in numbers sufficient to be of value in its control. They comprise *Lissonota parva*, Cress., *Diplazon* (*Syrphoctonus*) *agilis*, Cress., *Hemiteles tenellus*, Say, *Bracon* (*Microbracon*) *pygmaeus*, Prov., *Euderus amphis*, Wlk., *Habrocytus phycidis*, Ashm., *Spilochalcis albifrons*, Walsh, *S. xanthostigmata*, Dimmock, *Euplectrus mellipes*, Prov., *Pachyneuron altiscuta*, How., *Telenomus* (*Phanurus*) *ovivorus*, Ashm., *Trissolcus euschisti*, Ashm., a species of *Phaeogenes* near *epinotiae*, Cushm., and unidentified species of 12 other genera. The introduction of parasites from England [*cf. R.A.E.*, A **21** 483] was begun in 1931, when it was unsuccessful, and continued in 1934, 1935 and 1937, when *Angitia nana*, Grav., *Agathis* (*Microdus*) *pumila*, Ratz., *Dicladocerus westwoodi*, Steph., *Chrysocharis laricinellae*, Ratz., and *Cirrospilus pictus*, Nees, were liberated in a forest 44 miles north of Belleville, from which all five species were subsequently recovered, and in 1938 and 1939, when four of them were released in other localities in Ontario. In 1942 and 1943, *Chrysocharis laricinellae* and *A. pumila* were recovered in such numbers at the original point of liberation that they were recolonised in other parts of Ontario, Quebec and New Brunswick. *C. laricinella* was also recovered in 1941 at the place at which it had been released in 1938. Collections made 5–10 miles from the original liberation point indicate that the parasites will not spread rapidly, and it is therefore considered advisable to recolonise them at frequent intervals in large areas of infested larch. Nothing is known of the biology of *Cirrospilus pictus*; the other four species are internal larval parasites, hibernating in the host as first-instar larvae.

Atwood (C. E.). **The Status of the Spruce Budworm in Ontario and western Quebec in 1943.**—*74th Rep. ent. Soc. Ont. 1943* pp. 52–54. Toronto, 1944.

The form of the spruce budworm [*Harmologa fumiferana*, Clem.] that attacks balsam fir [*Abies balsamea*] and spruce [*cf. R.A.E.*, A **32** 178] continued to be the most destructive forest insect in eastern Canada in 1943 [*cf.* **30** 313; **31** 134, 348]. The main outbreak spread considerably and extended from the Coulonge River to the White River, and severe outbreaks were present in other parts of Ontario. All the forested areas of the Province in which balsam fir is found appear to support a light infestation; the eastern limit of this infestation is not known, but it is east of the Gatineau Valley. While the outbreak has continued to spread on the whole, a number of small isolated infestations have practically died out without causing much tree mortality. The total area within which salvage is no longer possible appears to be about 12,000–15,000 square miles, and round these areas are much more extensive ones, totalling probably an additional 30,000 square miles, where no extensive killing has yet occurred. The loss of balsam fir due to attack by the budworm is discussed [*cf.* **30** 113], and it is pointed out that other serious results of attack are increased fire hazard, which is very considerable in the devastated areas for about ten years after the peak of an outbreak, and the change in forest composition effected by wholesale destruction of balsam; reproduction in forests killed by *Harmologa* usually consists of a very high proportion of balsam, often so dense that it may partly stagnate at an early age and fail to make proper growth, providing conditions suitable for another budworm outbreak within about 50 years, and producing only a small crop of pulpwood. Since egg counts at some ten representative points indicated that a heavy attack would probably occur again in 1944, the author discusses the possible directions of spread of the outbreak.

Twinn (C. R.). **A Summary of the more important Insect Pests in Canada in 1943.**—*74th Rep. ent. Soc. Ont. 1943* pp. 54–59. Toronto, 1944.

In addition to many pests of common occurrence in Canada, the insects recorded include *Heliothis ononis*, Schiff., the larvae of which feed on the seeds

in the capsules of flax and first attracted attention in Saskatchewan in 1942. It was widespread in flax fields in the west-central part of the Province in 1943, reducing the seed crop by up to 12 per cent. and was also found in one field in Alberta. *Epilachna varivestis*, Muls., was found for the first time in Quebec [*cf. R.A.E.*, A **33** 139], and the northern limits of the infestation in the south of the Province were only a few miles from areas in which beans are grown for canning. Scattered but severe infestations occurred in southern Ontario, and the beetle was found to be widespread in some counties north of the eastern end of Lake Ontario for the first time. It was not observed in New Brunswick, where it first appeared in 1942 [**32** 284]. *Pemphigus betae*, Doane, caused a serious reduction in tonnage and sugar content of sugar-beets from several fields in southern Alberta, where it has not previously been so injurious.

Lord (F. T.). **The Use of *Drosophila melanogaster* Meig. for comparing the Toxicity of Stomach Poison Dusts.**—*Sci. Agric.* **24** no. 7 pp. 320–326, 1 fig., 4 refs. Ottawa, 1944.

Investigations on the control of *Rhagoletis pomonella*, Walsh, which has been very injurious on blueberry in Nova Scotia for several years, have been carried out in the field [*cf. R.A.E.*, A **32** 283], but since the habits of the adult and the nature of its environment make a direct comparison of poison treatments impossible in the field, and since it is a difficult insect to handle in the laboratory, a technique was devised by which preliminary tests of various insecticides could be made on *Drosophila melanogaster*, Mg. Parallel tests with adults of the blueberry and apple races of *R. pomonella* indicated that their reactions to some of the common poisons were similar to those of *D. melanogaster*.

The flies to be tested were confined in a lantern globe, where they were supplied with water from a wick and food from a section of paper that had been soaked in diluted honey, dried and then coated with an insecticidal dust. The dead flies were removed from the globes each day, and their sex was determined. The method of rearing the flies, the preparation of the globes and food material and the technique of putting the flies in the globes are described. Tests showed that honey was somewhat better than cane sugar as food, that the number of flies per globe, the concentration of honey and the amount of feeding surface per fly all had an important bearing on the results, that the prepared food did not deteriorate greatly with age and that a dust film on it did not seem to act as a mechanical barrier that prevented the flies from obtaining enough food. In toxicity tests, the average periods of survival in days of female flies (which lived rather longer than males) were 4·3, 6·1 and 7·5 for undiluted calcium arsenate, synthetic cryolite and lead arsenate, respectively, and 27·3 for no poison. Various diluents seemed to have little influence on the speed of action of these poisons, except that gypsum appeared to increase that of both lead arsenate and cryolite slightly, and hydrated lime to reduce that of cryolite considerably. In tests with calcium arsenate alone and mixtures of copper sulphate, calcium arsenate and hydrated lime and of copper sulphate and hydrated lime in different proportions, dilution with copper sulphate and lime did not appear to have much influence on the toxicity of calcium arsenate and, increasing the proportion of copper sulphate to lime appeared to have little or no influence in shortening the life of the caged flies.

Paul (L. C.) & King (K. M.). **Flour, a Substitute for Bran in Grasshopper Bait.**—*Sci. Agric.* **24** no. 7 pp. 332–340, 7 refs. Ottawa, 1944.

The authors describe the research on grasshopper baits carried out in Saskatchewan and Manitoba since 1934, and discuss the saving in expense effected by the different modifications of the formulae. The following is based on their summary. The data given show that a grasshopper bait in which the carrier

consists of low-grade flour and sawdust (1 : 13 by volume) has been as effective as the more expensive bait containing equal volumes of bran and sawdust under conditions representative of the northern Great Plains, liquid sodium arsenite being the poison used with both carriers, and no other ingredient but water being added [*cf.* *R.A.E.*, A **32** 145]. The bait of flour and sawdust has been used almost exclusively in Saskatchewan since 1938, because of its efficiency, availability and low cost, and the minimum savings due to its use have averaged approximately 45 per cent. In the major campaign of 1939, this represented a sum of about 88,000 dollars. The aggregate savings have had an important bearing on the administrative aspects of grasshopper control. Other advantages of this bait are that flour is required in such relatively small quantities that it can readily be obtained and transported in cases of emergency and takes comparatively little storage space, and that the high proportion of sawdust makes it less attractive to livestock than bait that is half bran.

Baker (A. D.) & Perron (J. P.). **Life History Studies of the Pea Moth, *Laspeyresia nigricana* (Steph.), on the Gaspe Coast.**—*Sci. Agric.* **24** no. 7 pp. 341–349, 4 graphs, 14 refs. Ottawa, 1944.

In this paper, which is the second of a series [*cf.* *R.A.E.*, A **33** 141], results of observations on the life-history of the pea moth, *Cydia* (*Laspeyresia*) *nigricana*, Steph., made on the Gaspé Coast of Quebec for several years, are given and compared with others published in Canada and the United States [*R.A.E.*, A **9** 384 ; **24** 497, etc.]. The adults emerged when wild food-plants were in flower and beginning to develop fruit, but cultivated peas were usually in full bloom about the time of peak emergence [*cf.* **33** 141]. In the five years from 1937 to 1941 the peaks occurred on different dates from 15th to 30th July, and the total emergence periods ranged from 30 to 56 days. Emergence tended to follow a period of bright, warm weather, and was assisted or even accelerated by an adequate supply of moisture. Oviposition usually began 5–6 days after emergence and finished about the middle of August. The eggs were laid on any part of the pea plant above ground or on wild food-plants and hatched in 5–9 days ; the peak of infestation in peas was usually reached during the first two weeks of August, injury becoming increasingly pronounced thereafter. The larvae usually matured in 3–4 weeks and most of them left the peas during the last week of August or the first of September. They dropped to the ground and immediately burrowed into the soil, where they constructed cocoons in which to hibernate. Pupation did not begin until the following June, and the pupal stage lasted about 10–21 days. No evidence was found of a second generation in the year on the Gaspé coast, but most larvae that were allowed to spin their cocoons in soil in the autumn and were then kept at room temperature with sufficient moisture pupated and transformed to adults in December.

Service and Regulatory Announcements, July-September 1944.—*S.R.A., B.E.P.Q.* no. 160 pp. 57–73. Washington, D.C., U.S. Dep. Agric., 1944.

An announcement relating to Quarantine no. 45 against the gipsy moth [*Lymantria dispar*, L.] and the brown-tail moth [*Nygmia phaeorrhoea*, Don.] in the United States contains Administrative Instructions (B.E.P.Q. 536) authorising the movement inter-state from areas infested by *L. dispar* of Christmas trees and evergreen boughs that have been fumigated with methyl bromide, which has been shown to be toxic to the eggs. The treatment must be carried out by approved methods in the presence of an inspector.

Other information in this part includes summaries of the current domestic and foreign plant quarantines applying to the United States and the Territories of Porto Rico and Hawaii, and of other restrictive orders under the Plant

Quarantine Act [*R.A.E.*, A **17** 163], and a supplement to plant quarantine restrictions already noticed in the Union of South Africa.

REHN (J. A. G.). **The Rhaphidophorid** *Tachycines asynamorus* **Adelung in America (Orthoptera, Gryllacrididae, Rhaphidophorinae).**—*Ent. News* **55** no. 2 pp. 36–39, 15 refs. Lancaster, Pa., 1944.

Tachycines asynamorus, Adel., has been found in several parts of the United States east of the Rocky Mountains on many occasions since 1898, usually in greenhouses [*cf. R.A.E.*, A **27** 651] or cellars, and has also been taken in Ontario. Until some time after 1920, however, it was always recorded in the American literature as a species of *Diestrammena*, usually *D. marmorata*, De Haan, which is not known to occur in North America.

In 1920, Blatchley proposed the new name *D. japanica* for *D. marmorata*, as the latter is preoccupied by [*Scirtetica*] *marmorata*, Harr., both species having been originally described in *Locusta*. Hebard (1925) considered *japanica* a synonym of *T. asynamorus*, since Blatchley described the latter in proposing it, but Karny (1930), who amended the name to *japonica*, and several other taxonomists regard it as a valid name for *D. marmorata*.

A list is given of localities in the United States in which *T. asynamorus* has been found, and it is recorded for the first time from Pennsylvania, where it was taken in the cellar of a house in numbers sufficient to require control.

LA RIVERS (I.). **A Summary of the Mormon Cricket** (*Anabrus simplex*) **(Tettigoniidae : Orthoptera).**—*Ent. News* **55** nos. 3–4 pp. 71–77, 97–102, 33 refs. Lancaster, Pa., 1944.

Data on the history of *Anabrus simplex*, Hald., in the United States, the measures used for its control and its natural enemies are reviewed, and observations are recorded on its feeding habits and insect enemies in northern Nevada. During 1939, it was estimated that more than half a million examples of *Anabrus* were destroyed in an area of half a square mile by about 30,000 adults of *Chlorion* (*Palmodes*) *laeviventris*, Cress. The female of this Sphegid made a burrow in loose soil, usually stocked it with two paralysed examples of the Tettigoniid, laid an egg on each and then closed the burrow and repeated the process. Some ten per cent. of the brood, however, were destroyed by insects that utilised the paralysed hosts as food for their own larvae. They comprised the Sarcophagids, *Eumacronychia elita*, Tns., and *Euaraba tergata*, Coq., which entered the open burrows in the absence of the wasp and deposited up to 20 larvae on each paralysed host, and the Bembicid, *Stizoides unicinctus*, Say, which dug up the completed burrows, chewed the eggs of *Chlorion* and deposited its own. Considerable numbers of adults of *Chlorion* were killed by a small rodent (*Onychomys*) and a shrew (*Sorex*) and some by three species of birds. In northern Nevada, approximately 33 per cent. of a given sample of *A. simplex* were parasitised by *Sarcophaga tuberosa*, Pand., which possibly rendered them infertile, but large numbers of this fly were destroyed by the Bembicid, *Stictiella pulla*, Handlirsch, in some localities.

WEISS (H. B.). *Gnorimoschema operculella* **(Zell.) in New Jersey (Lep.).**—*Ent. News* **55** no. 5 pp. 135–136. Lancaster, Pa., 1944.

A severe outbreak of *Gnorimoschema operculella*, Zell., occurred on potato in the southern half of New Jersey in the summer of 1943. The moth had previously been observed in the State only occasionally, and had not been expected to become a pest, as the usual climatic conditions and local methods of handling the potato crop are unfavourable for its development. In 1943, however, the

summer was warm and dry, and potatoes from the south had been stored in New Jersey and than dumped as unfit for food. Some of these were found to be severely infested.

SAILER (R. I.). **The Genus** *Solubea* **(Heteroptera : Pentatomidae).**—*Proc. ent. Soc. Wash.* **46** no. 5 pp. 105–127, 15 figs. Washington, D.C., 1944.

This revision includes descriptions of the eight species of *Solubea* recognised by the author, with notes on their synonymy, distribution and economic importance. Three species and one subspecies are new. The members of this genus are confined to America and are, in the main, neotropical, and all are actual or potential pests of cereals. The most important species, and the only one that is predominantly nearctic, is *S. pugnax*, F., which is injurious to various cereals and grasses in the United States and is a very serious pest of rice, particularly in Arkansas and Texas [*cf. R.A.E.*, A **30** 566, etc.]. The others known to cause damage, to rice in each case, are *Solubea insularis*, Stål, in Mexico [**16** 434], *S. ornata*, sp. n., in Porto Rico, and *S. poecila*, Dall., which is transferred from the genus *Mormidea*, in Brazil [*cf.* **24** 92, 370], British Guiana [**23** 200], and Dutch Guiana, where it has been recorded as *M. ypsilon*, L. [**11** 91]. *S. ornata* has also been found on rice in Santo Domingo, and *S. poecila* in Trinidad.

WEBER (N. A.). **The neotropical Coccid-tending Ants of the Genus** *Acropyga* **Roger.**—*Ann. ent. Soc. Amer.* **37** no. 1 pp. 89–122, 24 figs., 8 refs. Columbus, Ohio, 1944.

Descriptions are given of the American species of *Acropyga*, of which ten are new and all belong to the subgenus *Rhizomyrma*, with notes on the biology of some of them and a key to the workers. These ants tend Coccids on the roots of plants, and some of them are associated with Coccids that cause injury to coffee in Brazil [*R.A.E.*, A **16** 382; **17** 396; **19** 693], Dutch Guiana, where the Coccids transmit an infectious phloem necrosis [**23** 679], and Colombia [**24** 784]. The author has observed and collected a number of species of *Acropyga* tending Coccids that have not yet been identified in various parts of tropical America; those associated with Coccids on the roots of plants of economic importance comprised *A. berwicki*, Wheeler, and *A. urichi*, sp. n., on cacao roots and also on roots under cacao, coffee and banana that may have belonged to any of these plants in Trinidad, *A. rutgersi*, Bünzli, on banana in Venezuela and on a pasture grass (*Axonopus compressus*) in British Guiana, and *A. mesonotalis*, sp. n., on coffee in Haiti.

CALLAN (E. McC.). **A Note on** *Phanuropsis semiflaviventris* **Girault (Hym., Scelionidae), an Egg-parasite of Cacao Stink-bugs.**—*Proc. R. ent. Soc. Lond.* (A) **19** pt. 4–6 pp. 48–49, 6 figs., 2 refs. London, 1944.

Mecistorhinus piceus, P. de B., and *M. tripterus*, F., are the commonest of several Pentatomids that attack cacao in Trinidad, where they sometimes attain the status of minor pests in nurseries. The females of all species of *Mecistorhinus* lay eggs in masses of 25–30 on the lower surface of the leaves of the food-plants; they remain near them and the newly-hatched nymphs, and probably protect them from predators. The eggs of *M. piceus* and *M. tripterus* in Trinidad are generally parasitised, frequently by *Phanuropsis semiflaviventris*, Gir. From 25 to 90 per cent. of the eggs in most egg-masses were parasitised by this Scelionid, but the eggs towards the centre of each mass were not attacked; this is regarded as evidence that the presence of the female also provides some protection from parasites.

Brann jr. (J. L.). **The Scurfy Scale and its Control in the Hudson Valley.**—*Proc. N.Y. St. hort. Soc.* **89** pp. 157–162. Le Roy, N.Y., 1944.

Surveys carried out in 1943 showed that the scurfy scale [*Chionaspis furfura*, Fitch] has spread considerably in the Hudson Valley, New York, where it is injurious to apple trees. The author describes its present distribution and gives notes on its bionomics [*cf. R.A.E.*, A **26** 562] and control [*cf.* **26** 562 ; **30** 574].

Dean (R. W.). **Developments in European Red Mite Control.**—*Proc. N.Y. St. hort. Soc.* **89** pp. 162–164. Le Roy, N.Y., 1944.

Tests on the control of the European red mite [*Paratetranychus pilosus*, C. & F.] on apple by means of dormant and semi-dormant sprays [*cf. R.A.E.*, A **31** 305] were continued in New York. When emulsified with blood albumen and used in the dormant stage, a naphthenic oil was as effective as paraffinic and highly paraffinic types at concentrations up to 2 per cent., but less effective at 3 and 4 per cent. The best control (96·7 per cent.) was obtained with the highly paraffinic oil at 4 per cent. When emulsified with Bordeaux mixture (2 : 4 : 100) and applied at 2 and 3 per cent. at the green-tip stage, the highly paraffinic oil gave the best control at both concentrations (98·8 and 99·6 per cent.), but the ordinary paraffinic oil was less effective than the naphthenic oil at 2 per cent. When emulsified with blood albumen and applied at 2 and 3 per cent. with the fungicide Fermate [ferric dimethyl dithiocarbamate] or emulsified with Bordeaux mixture and applied at 3 per cent. at the delayed dormant stage, the highly paraffinic oil was most effective in all tests (98, 100 and 99·6 per cent. control), and the ordinary paraffinic type was more effective than the naphthenic type at 2 per cent., but less effective at 3 per cent. All three oils gave more control with blood albumen than with Bordeaux mixture.

Investigations with ten spray mixtures to be applied at the pink stage, either following early oil applications or as the sole treatment against the mite, showed that the most effective treatments are those that are good ovicides, although these applications are made when all overwintering eggs are considered to have hatched and no summer eggs have been deposited. Of these, only a spray of 1 per cent. summer oil with Fermate is practical from the standpoints of cost, availability and safety to the tree. A calyx application of sulphur was used after this spray without injury.

Brann jr. (J. L.). **Evaluation of Codling Moth Insecticides.**—*Proc. N.Y. St. hort. Soc.* **89** pp. 170–179. Le Roy, N.Y., 1944.

In further experiments on the control of the codling moth [*Cydia pomonella*, L.] on apple in New York, carried out in 1943 [*cf. R.A.E.*, A **31** 410], calyx, curculio and special scab sprays were followed by four cover sprays against the first generation in June and July and two against the second in August. All quantities of spray ingredients are per 100 U.S. gals. water ; lead arsenate was used at the rate of 3 lb., and hydrated lime was used with it (except in sprays containing DX) at 1 lb. in the first three cover sprays and 3 lb. in the last three. B-1956 (phthalic anhydride glycerol alkyd resin) was added at 2 per cent. to all summer oils and 10 per cent. to Lethane 60 (50 per cent. aliphatic thiocyanate) as an emulsifying agent. Substitutes for lead arsenate were compared with no treatment and with 2, 4 or 6 cover sprays of lead arsenate, and it was shown that not more than three lead-arsenate sprays can be applied unless the apples are to be washed, and that six cover sprays of lead arsenate give poor control (73·4 per cent. uninjured apples as compared with 20·5 per cent. for no treatment) unless supplements are added.

Six cover sprays of 3 lb. natural or synthetic cryolite, with the addition of ¼ lb. skim milk powder in the last four, gave only 54 and 59·4 per cent. uninjured fruit, and two sprays of lead arsenate followed by four of synthetic cryolite with

skim milk or 2 U.S. quarts summer oil gave 65·9 and 77·2 per cent. All these treatments resulted in very rough fruit skins and fluorine residues above the legal tolerance. Four applications of 2 lb. phenothiazine, alone or with 2 oz. blood albumen and 2 U.S. quarts kerosene or with 8 oz. B–1956 in the first and 2 oz. blood albumen in the others, following two of lead arsenate, gave 95·1, 89·1 and 87·5 per cent. uninjured fruit, but the first two left an unsatisfactory dark residue [*cf. loc. cit.*] ; the residue from the third was less objectionable, being chiefly concentrated on the lower side of the apple, but was too heavy for its commercial use. After two sprays of lead arsenate, four of tank-mixed fixed nicotine (¾ U.S. pint nicotine sulphate, 5 lb. bentonite and 1 U.S. quart soy-bean oil) gave 83·2 per cent. uninjured fruit, but left too much residue at harvest, and four of ½ U.S. pint nicotine sulphate and 2 U.S. quarts summer oil gave only 68 per cent.

Tests were made with a proprietary material known as DX. The ingredients of this preparation have been changed frequently, but the material used in 1943 contained nicotine alkaloid and Lethane 60 [*cf.* **30** 190]. When used at the rate of 1½ U.S. pints with lead arsenate in the first two sprays and with 2 U.S. quarts summer oil in the third, fifth and sixth, the fourth consisting of lead arsenate alone, it gave 78·2 per cent. uninjured fruit, but caused much more severe scorching of the foliage than any other treatment. A schedule of lead arsenate in the first, second and fourth cover sprays and a proprietary fixed nicotine (1½ lb. Black Leaf 155) with 2 U.S. quarts summer oil in the others gave only 71·6 per cent. uninjured fruit. A programme of two cover sprays of lead arsenate with 1 U.S. pint Lethane 60, a third, fifth and sixth of 1 U.S. pint Lethane and 2 U.S. quarts summer oil and a fourth of lead arsenate alone resulted in 77·1 per cent. uninjured fruit, and one in which 1 U.S. pint nicotine sulphate was substituted for the Lethane in 83·5 per cent. ; the ratio of entries to superficial injuries was significantly higher in the Lethane plot.

In tests of intensive schedules against the first generation only, one block of trees was sprayed with the recommended programme of two cover sprays of lead arsenate with ½ U.S. pint nicotine sulphate, followed by a third of nicotine and oil and a fourth of lead arsenate alone, and the other with a similar one with the substitution of 1 U.S. pint Lethane 60 for the nicotine. Poor control was obtained because of migration from neighbouring orchards. The Lethane treatment was very ineffective, probably because it controlled few larvae of the first generation and failed to kill the moths. In laboratory and field tests, caged moths were killed by nicotine sulphate at concentrations as low as 1 : 3,200, whereas Lethane was relatively ineffective at 1 : 100.

Other materials tested included xanthone, which was less effective than lead arsenate and caused russetting if used before the third cover spray, and a castor bean product known as Spray Kast, which showed some toxicity, but was slow in action, so that most of the larvae entered the fruit before dying, and caused considerable superficial spotting.

It is concluded that the most effective schedule for the more heavily infested areas of the Hudson Valley is one of two cover sprays of lead arsenate with nicotine followed by a third, fifth and sixth of nicotine and oil and a fourth of lead arsenate with a suitable spreader and adhesive. In the less heavily infested areas or where the migration of moths of the first generation from neighbouring orchards is not important, the first four cover sprays should give satisfactory control if applied thoroughly at the correct times. Nicotine sulphate can be used in any of the sprays and fixed nicotine (Black Leaf 155) in the third, fifth and sixth ; the fixed compound has a slightly longer residual effect.

Hamilton (D. W.). **Report of Progress with Dusting for Codling Moth Control.**— *Proc. N.Y. St. hort. Soc.* **89** pp. 180–185. Le Roy, N.Y., 1944.

In tests of dusts for the control of the codling moth [*Cydia pomonella*, L.] on apple in New York in 1943, five applications were made at approximately

seven-day intervals against the first generation, beginning just before the first entrances were expected, and three against the second. The most satisfactory time for dusting was just after daybreak, when wind velocities were lowest and the foliage was usually damp. The average amount of dust per tree per application varied from 2·2 to 3·5 lb., and micronised sulphur was used as the carrier in all mixtures. The dust schedules were compared with a spray schedule consisting of two applications of 3 lb. lead arsenate, ½ U.S. pint nicotine sulphate and 8 lb. sulphur per 100 U.S. gals. against the first generation followed by one application of 3 lb. nicotine bentonite and 4 lb. sulphur per 100 U.S. gals. against the first generation and one against the second. The results obtained with dusts are followed by corresponding ones from sprays in brackets. Dusting with lead arsenate and sulphur (20 : 80) in all applications resulted in 82·4 (86·2) per cent. uninjured fruit; a dust of lead arsenate, oil (viscosity 100 Saybolt) and sulphur (20 : 2 : 78) adhered much better, but gave only 88·5 (91·4) per cent. uninjured fruit. The best results were obtained with dusts to which nicotine bentonite (14 per cent. fixed nicotine) was added. Mixtures of lead arsenate, nicotine bentonite and sulphur (20 : 20 : 60) in the first, second, third, sixth and seventh applications and of lead arsenate and sulphur (20 : 80) in the remainder gave 88·3 (89·8) per cent. uninjured fruit and a similar arrangement of dusts of lead arsenate, nicotine bentonite, oil and sulphur (20 : 10 : 2 : 68) and lead arsenate, oil and sulphur (20 : 2 : 78) gave 89·8 (88·4) per cent. A similar programme using lead arsenate, nicotine bentonite, oil, hydrated lime and sulphur (20 : 20 : 2 : 20 : 38) and lead arsenate, oil and sulphur (20 : 2 : 78) was the most effective, giving 93 (90·8) per cent. uninjured fruit. The lime caused a rapid release of part of the nicotine, which may have killed a number of moths by contact. In tests with caged moths, this dust killed many under laboratory conditions, but fewer in the field, where moths in the centre of the tree, where they were protected from the dust stream, had a much higher rate of survival than those in unprotected positions. The lime also made the dust flow more readily and produce a smoother deposit. The dusts containing nicotine bentonite and oil resulted in deposits of lead slightly above the legal tolerance (0·05 grain per lb. fruit) at harvest, but the arsenic deposits were within the tolerance, and it is considered that residues from these schedules would generally be within tolerance after the fruit had been handled as usual. The sulphur injured a small proportion of the fruit, particularly where oil was included in the dust, and it may be advisable to use another carrier in July and August if scab has been controlled earlier in the season.

The relative cost of dusting and spraying is discussed.

DEAN (R. W.). **The Apple Maggot.**—*Proc. N.Y. St. hort. Soc.* **89** pp. 186–191, 10 refs. Le Roy, N.Y., 1944.

The author points out that the codling moth [*Cydia pomonella*, L.] and adults of the apple maggot [*Rhagoletis pomonella*, Walsh] appear and must be controlled at about the same time during the growing season in the Hudson Valley [*cf. R.A.E.*, A **31** 3], that lead arsenate is the only insecticide that is effective against both, but that it kills *Rhagoletis* too slowly to prevent oviposition by migrating flies [**31** 4] and involves the danger of leaving excessive lead and arsenic residues on the harvested fruit if it is used at the proper time. He discusses the results obtained with various substitutes for lead arsenate against *R. pomonella*. In 1943, sprays of 4 lb. synthetic cryolite per 100 U.S. gals., applied on 25th June and 19th July, proved ineffective. Tests were also made of a programme developed in Connecticut, in which an adhesive formula that produces an " inverted " spray mixture of lead arsenate and oil is used [*cf.* **30** 549; **31** 483, 505]. A delayed dormant spray of lime-sulphur, a pink spray of the fungicide Fermate (ferric dimethyl dithiocarbamate) and calyx, curculio and

first cover sprays of lead arsenate, Fermate and the Connecticut adhesive resulted in 74·6, 63·2 and 91·9 per cent. control of the apple maggot, curculio [*Conotrachelus nenuphar*, Hbst.] and scab, respectively, and 63·6 per cent. clean apples ; the corresponding figures for a similar schedule using Modified W.S.C. Dynamite [*cf.* **25** 653] as the adhesive in the last three sprays were 0, 66·8, 59·5 and 30·7. In both cases, spray residues were well below the tolerance. It is considered that the first schedule gave satisfactory control of apple maggot and scab, but not of curculio, and it is doubtful whether such a programme would control *C. pomonella*.

Fenton (F. A.) & Whitehead (F. E.). **Control of Wheat Insects.**—*Bull. Okla. agric. Exp. Sta.* no. B-275, 46 pp., 24 figs., 4 refs. Stillwater, Okla., 1944.

Notes are given on the bionomics and control of the principal insects and a mite that attack wheat in the field and of insects that infest stored wheat in Oklahoma, with descriptions of the injurious stages and of the damage they cause, and maps showing the parts of the State in which most of them are likely to be found. The pests are recorded under their popular names only, and are classified as those infesting the leaves, stems and heads, those infesting the roots and those attacking stored wheat. The times of year when attacks can be expected to occur are indicated.

Arbuthnot (K. D.). **Strains of the European Corn Borer in the United States.**—*Tech. Bull. U.S. Dep. Agric.* no. 869, 20 pp., 4 figs., 19 refs. Washington, D.C., 1944.

A laboratory investigation was made in Connecticut in 1937–40 to discover whether the strain of *Pyrausta nubilalis*, Hb., that is predominant on maize in the Lake States (one-generation area) is biologically distinct from that predominant in the eastern United States (two-generation area), and to study their physiological relationships, a knowledge of which is important in the formulation of quarantine regulations, in the development of control measures and in practical control, notably by biological methods [*cf. R.A.E.*, A **33** 138]. Evidence of the occurrence in recent years of a partial second generation in the Lake States is reviewed [*cf.* **27** 414]. For most of the experiments, larvae collected near New Haven, Connecticut, and Toledo, Ohio, were used ; the rearing technique, which is described, was a modification of one already noticed [**25** 23].

The following is based largely on the author's summary. The material from New Haven was found to represent a homozygous multiple-generation strain, and no evidence was obtained to indicate the occurrence of a single-generation strain in that locality, whereas that from Toledo comprised a mixed population of multiple- and single-generation strains that apparently interbreed in the field. A homozygous single-generation strain was isolated in one generation from the Toledo material, but attempts to isolate a homozygous multiple-generation strain were unsuccessful, some larvae entering into diapause before pupating in each of four successive generations of every line that was selected. Hence the genetic factors for the single-generation habit evidently persisted as recessive characters.

Larvae of the single-generation strain from Toledo and districts in Michigan and western New York developed more slowly than those of the multiple-generation strain from New Haven ; the laboratory-reared heterozygous multiple-generation larvae from Toledo developed at a rate intermediate between the two. Moths from the New Haven and Toledo field stocks mated more readily with individuals from their own locality than with those from the other stock. Mating between New Haven females and Toledo males occurred in only a few instances, apparently because of a racial inhibition, the nature of which was not discovered. When females from either stock were mated with

males from the other, larval survival among the progeny was higher than when they were mated with males from the same district, probably as a result of heterosis ; larval mortality in the F_2 generation, however, was very high. Toledo females crossed with New Haven males produced progeny that resembled the males in development. The reciprocal cross produced diapausing and non-diapausing phenotypes with a preponderance of males among the latter, and the rate of development of larvae of the F_2 generation was retarded ; both these results are evidence of the paternal diapause characters.

These experiments are thought to provide proof of the existence of biologically distinct strains.

Robinson (R. H.) & Hatch (M. B.). **Rotenone Dust and Sprays. Loss of Rotenone and Deguelin from alkaline and acid Rotenone Dust Mixtures and Sprays.**—*Soap* **20** no. 4 pp. 125, 127, 129, 131, 5 refs. New York, N.Y., 1944.

Since the widespread use of dusts and sprays prepared from the rotenone-bearing roots makes it desirable to combine them with other insecticides, fungicides and many acid and alkaline diluents, chemical investigations were carried out to determine the conditions under which loss of rotenone occurs from various dust mixtures and spray suspensions. Finely ground derris root was mixed with various alkaline, acid and neutral dust diluents, and each mixture was divided into two parts that were stored in open paper bags, one under dry conditions and the other in a moist atmosphere (40 per cent. relative humidity or more during daytime and practically 100 per cent. at night). They were analysed colorimetrically for rotenone and deguelin values immediately after mixing and after 3, 6 and 12 months, and the results of the analyses are given in tables. They show very little loss of the active components in most of the mixtures, probably because the moisture contents were relatively low, though some alkaline mixtures, such as that of derris, bentonite and hydrated lime (1 : 3 : 1), absorbed sufficient moisture to facilitate slow but definite decomposition. Such losses as occurred were due to the slow action of light and air. There was little difference in loss between identical dust mixtures kept in moist and in dry storage or between alkaline dusts and acid and neutral mixtures. Petroleum oil in the dusts was apparently an inert substance, but both soy-bean and herring oils caused progressive decomposition of the rotenone and deguelin during the storage period, analysis of one series after storage for two years showing a loss of about 30 per cent. When water was added to several of the dusts to produce a moisture content of 50 per cent., and these dusts and dry duplicates were stored at 23°C. [73·4°F.] for seven days, analyses, the results of which are tabulated, showed that rotenone and deguelin decompose rapidly in alkaline dust mixtures with sufficient moisture, conditions being optimum for oxidation in an alkaline environment ; there was very little decomposition in acid mixtures.

To determine whether rotenone and deguelin decompose rapidly in spray suspensions, similar acid and alkaline mixtures were added to water to give a concentration of 5 lb. derris per 100 U.S. gals. The suspensions were sprayed on glass plates immediately after preparation and after 5 hours, 24 hours and 3 days, and the dried deposits were extracted with acetone and analysed. No decomposition was indicated after 5 or 24 hours for either acid or alkaline mixtures, but small losses developed in all mixtures after three days, and it is concluded that rotenone-bearing roots may be used with either alkaline or neutral spray materials or spreaders without fear of decomposition during the short period in the spray tank and while drying on the plants.

Very heavy deposits of the dusts used in the storage tests were obtained on cherry foliage by applying them to excess early in the morning while there was still moisture on the leaves and little or no wind, and duplicate samples of leaves

averaging about 200 sq. cm. of surface were analysed immediately and each morning afterwards for six days. The results obtained were erratic ; the amount of dust deposited by the different mixtures varied materially, and mechanical losses due to wind, rain and rubbing of the leaves made comparisons impossible, but there was no evidence that any of the alkaline mixtures lost the active components more rapidly than the neutral or acid ones. After six days, appreciable amounts remained from all the dust mixtures, and it is assumed that, apart from mechanical factors, decomposition by direct sunlight was the only cause of loss, and that this was similar for all dusts.

Fox (W. B.). **An unusual Egg laying Site for the Two-striped Grasshopper.**—*Canad. Ent.* **76** no. 5 p. 111, 1 fig. Guelph, Ont., 1944.

Melanoplus bivittatus, Say, which usually lays eggs in ditches, drift soil and crop margins, was observed during the autumn of 1942 in southern Saskatchewan to oviposit in exposed piles of wheat left in grain fields at harvest time. The temperature of the surface of the piles, owing to heating of green weed seeds, was about 80°F., as compared with an air temperature of about 50°F., and this attracted many adults of *M. bivittatus* and a few other grasshoppers to the piles during the cool weather.

Thirty-eighth annual Report of the Department of Agriculture (British Columbia) for the Year 1943.—152 pp. Victoria, B.C., 1944.

In the Report of the Horticultural Branch (pp. 31–53), W. H. Robertson gives an account of the organisation and policy of the work against *Psylla pyricola*, Först., on pear in British Columbia, carried out in co-operation by Provincial and Dominion authorities and the Department of Agriculture of the United States [*cf. R.A.E.*, A **33** 142]. Preliminary tests having shown that the tarnished plant bug [*Lygus oblineatus*, Say], which has been a major orchard pest for many years, is easily killed by Pyrocide [pyrethrum] dust, derris dust and 4 per cent. Diesel oil alone or with dinitro-ortho-cresol, experiments were carried out in two districts on the possibility of destroying it while it is still on the cover crop [*cf.* **31** 413]. In one of them, Pyrocide dust and a spray of 4 gals. Diesel oil and 1 lb. dinitro-o-cresol (40 per cent.) per 100 gals. water, applied to a cover crop of lucerne on 1st September, both gave excellent kills of the bug, and the spray was also effective against the buffalo treehopper [*Ceresa bubalus*, F.]. In the other, Pyrocide and a proprietary derris dust applied in late April did not appear to reduce subsequent injury to the fruit, but their ineffectiveness may have been due to cool weather at the time of application. To determine whether the adults could be controlled before hibernation, the cover crop of buckwheat and weeds on one acre of full-sized apple trees in the same district was treated on 13th October with approximately 500 gals. of a spray of 4½ per cent. Diesel oil containing dinitro-o-cresol, and the cover crop of weeds and lucerne on approximately 3 acres of peaches with Pyrocide dust at about 100 lb. per acre. The numbers of adults swept from an area ten feet square were reduced from 176 to four and from 172 to one, respectively. Although the September and October treatments destroyed large numbers of the bugs, their practical efficiency in reducing damage to the fruit trees could not be determined in the year they were applied.

In tests on the control of the cherry aphis [*Myzus cerasi*, F.] on cherries and the mealy plum aphis [*Hyalopterus arundinis*, F.] on Italian prune, sprays of 4 per cent. dormant oil with 1 pint nicotine sulphate per 100 gals. water and of 2 per cent. dormant oil with 1 lb. dinitro-o-cresol or 3 lb. Elgetol [a preparation containing sodium dinitro-o-cresylate] per 100 gals. were applied on 5th April when the buds were beginning to show a green tip, because weather conditions had prevented earlier treatment. No spray damage occurred and the treated trees were practically free of Aphids during the entire growing period, whereas untreated ones were lightly infested. The mealybug [*Phenacoccus aceris*,

Sign.] was found to be increasing on apple in the Kootenay districts owing to two cool damp summers in succession. The sprays recommended in the previous report [**31** 270] were effective.

The Report of the Provincial Plant Pathologist (pp. 59–64), by J. W. Eastham, includes an account of a local outbreak of *Nysius ericae*, Schill., which attacked a wide range of plants. It caused rather severe injury to potatoes, particularly medium-early varieties, and also damaged swedes and raspberry fruits. Only adults were found on 28th July, and small-scale dusting with derris had little effect, owing to their activity.

In the Report of the Provincial Entomologist (pp. 66–72), I. J. Ward records increases in the area and intensity of infestation by *Leptinotarsa decemlineata*, Say, in the East Kootenay district ; continued wet weather during 1942 had washed poisoned dust from the potato plants, and a heavy covering of snow during the winter had protected the hibernating adults in the soil from low temperatures. A derris dust, applied soon after the beetles left hibernation and before heavy egg-laying began, gave very good control, and this treatment at the rate of 20–25 lb. per acre, followed by thorough dusting with calcium arsenate (1 : 6) as soon as hatching is observed, is recommended. If heavy rain washes the calcium arsenate from the plants, another application should be made, and at least two applications are usually required to protect the plants throughout the growing season. Additional small infestations were found in other areas, including the South Okanagan Valley, where the presence of the beetle is a serious threat to larger potato-growing areas in the Province, as natural barriers have been crossed in its westward advance. Infestations in the valley probably originated from Okanogan County, Washington ; all but one were adjacent to the main highway, suggesting transport by traffic. They were heavily dusted, and beetles were picked from the infested plants, and no sign of infestation was found in late summer. Grasshoppers, chiefly *Melanoplus mexicanus mexicanus*, Sauss., were present in outbreak numbers in practically all parts of the Interior Dry Belt during the year. Range grasses were heavily damaged in some areas, and damage to hay, vegetable and seed crops was severe in some places, but not generally widespread as, owing to unusually late hatching of the insects, crops were well advanced before the grasshoppers moved from dry range-land to seek green food. Cutworms caused little damage to crops, but outbreaks of *Agrotis fennica*, Tauscher, occurred in lucerne fields in some districts in the middle of May, adjacent fields of asparagus, cereals and peas being attacked, and *Peridroma saucia*, Hb. (*Lycophotia margaritosa*, Haw.) caused severe injury to cabbage in one locality. Injury to onion by *Hylemyia antiqua*, Mg., was not heavy except in isolated cases. Experiments on the control of this Anthomyiid with poison bait were carried out at Vernon in May. Trays 12 inches wide, 18 inches long and one inch deep were filled with sawdust moistened with an arsenical solution containing onion powder to attract the flies, covered with a screen mesh to prevent animals from reaching the solution and put on the ground ; it was necessary to add moisture daily, owing to heavy evaporation. Flies were observed drinking from the trays, and a number of dead ones were found in them, indicating that many were killed. In an onion field one acre in extent, containing 18 trays, very few onions were infested and a crop of nearly 20 tons was harvested. This was in an area in which the insect had previously caused moderately heavy damage. Injury to cabbage by *H. brassicae*, Bch., was generally confined to early plantings ; dusting the holes in which the plants were to be set with derris seemed to give satisfactory control.

Balch (R. E.) & Hawboldt (L. S.). **Report on Forest Insects in New Brunswick, 1943.**—*107th Rep. Dep. Lds Min. New Brunsw. 1942–43* pp. 107–109. Fredericton, N.B., 1944.

Dieback of birch, associated with attack by *Agrilus anxius*, Gory, continued in New Brunswick in 1943, and stands of merchantable size are seriously

injured throughout practically the whole of the Province [*cf. R.A.E.*, A **32** 146, 327]. General principles of management to reduce the occurrence of dying, weakened and overmature trees and increase the rate of growth of hardwood stands are suggested [*cf.* **32** 110]. The limits of the distribution of the beech scale, *Cryptococcus fagi*, Baer., in the Province are indicated [*cf.* **32** 327]; this Coccid attacks the larger trees first, and salvage of these is advisable as soon as possible after infestation is found in a stand. Severe outbreaks of *Malacosoma disstria*, Hb., on the lower Tobeque resulted in complete defoliation of aspen and large-toothed poplar [*Populus tremuloides* and *P. grandidentata*] and white and grey birch [*Betula papyrifera* and *B. populifolia*] over an area of 30–40 square miles. Such outbreaks, which originate in stands in which the proportion of poplars has become high after fires, often last for three years, and reduce growth but seldom kill many trees. They are controlled by parasites and starvation.

A local outbreak of *Neodiprion abietis*, Harr., caused the loss of some 90 per cent. of old foliage of balsam fir [*Abies balsamea*] and slight defoliation of spruce. Small numbers of the Torymid, *Monodontomerus dentipes*, Boh., were liberated against this sawfly. *Gilpinia hercyniae*, Htg., was rather less numerous than in the previous year, although still the most common insect on spruce foliage, and there was no noticeable defoliation; 100,000 individuals of the strain of *Microplectron fuscipenne*, Zett., that prefers low temperatures and 19 colonies of *Exenterus* sp. and 26 of *Sturmia* sp. were liberated against it during the year [*cf.* **32** 146]. Other beneficial insects liberated were 3,700 individuals of *Agathis* (*Microdus*) *pumila*, Ratz., and 3,100 of *Chrysocharis laricinellae*, Ratz., against the larch casebearer [*Coleophora laricella*, Hb.], and 1,150 of *Mantis religiosa*, L., as a general predator.

Thomas (I.) & Heal (G. M.). **Chafer Damage to Grassland in North Wales in 1942–1943 by *Phyllopertha horticola* L. and *Hoplia philanthus* Fuess. I. Notes on Population, Life History and Morphology.**—*Ann. appl. Biol.* **31** no. 2 pp. 124–131, 1 map, 11 figs., 19 refs. London, 1944.

An account is given of observations in 1942–43 on the abundance and biology of *Anomala* (*Phyllopertha*) *horticola*, L. [*cf. R.A.E.*, A **29** 110] and *Hoplia philanthus*, Fuessly, in North Wales, in parts of which the larvae severely damaged grassland over a total area of some 400 acres. Morphological characters distinguishing the larvae and pupae of the two species are described, and the history of outbreaks of *A. horticola* in England and Wales is reviewed. Severe infestation of grassland occurred in southern and central Wales and in Westmorland between 1935 and 1943, and adults damaged apple fruitlets in the Conway Valley in 1935.

Damage by *A. horticola* first became noticeable in September 1942, when the larvae were in the third instar, but *H. philanthus* was not found to be concerned in the injury until December. Most of the grass in the areas heavily infested by either species was killed and the turf torn open by various birds that attacked the larvae, so that large patches became bare. The damaged areas increased in extent during the winter, but the larvae had ceased to feed by late spring and no further damage occurred until late summer. *A. horticola* was chiefly confined to pastures and hayfields in the bottoms and on the lower slopes of wooded valleys; in general, only grass in poor condition was severely damaged. *H. philanthus* was dominant and abundant only in sandy, low-lying fields in the south-eastern coastal district of Carnarvon. Larvae of *Melolontha* sp., *Amphimallon* (*Amphimallus*) *solstitiale*, L., and *Serica brunnea*, L., were also found occasionally. Surveys made prior to February 1943, showed populations of up to 1,850,000 per acre in the case of *Anomala horticola* and 1,000,000 in that of *H. philanthus*. In November and December, most larvae of *A. horticola* were within three inches of the surface of the soil.

Adults of *A. horticola* appeared in large numbers at the end of May ; they settled on weeds and on fruit and woodland trees, and damaged apple fruits and broad beans. First-instar larvae were numerous by 22nd July. In 1940, eggs and newly-hatched larvae had been noted on 28th June. In 1943, the larvae had all reached the second instar by 18th August and the third by 8th September, when damage in heavily-infested fields was considerable.

H. philanthus, which is locally abundant in England and Wales and is also recorded from Scotland, has been reported to damage lawns and the foliage of fruit trees. In December 1942, all the larvae were in the second instar. Third-instar larvae were first observed on 19th January, and by 18th February more than half had reached this instar. Pupation was nearly complete by 1st June, but adults were not observed until 29th. Eggs were laid in sandy turf in cages in July. First-instar larvae were present in the field on 12th August, and by 11th September only second-instar larvae were observed. The duration of the egg and larval stages appears to be very variable ; the life-cycle is generally completed in one year, but may in a few cases occupy a longer period.

Reynolds (J. M.). **The Biology of** *Tribolium destructor* **Uytt. I. Some Effects of Fertilization and Food Factors on Fecundity and Fertility.**—*Ann. appl. Biol.* **31** no. 2 pp. 132–142, 12 figs., 39 refs. London, 1944.

The following is the author's summary. A brief review of recent papers on *Aphanotus* (*Tribolium*) *destructor*, Uytt., is given [*cf. R.A.E.*, A **31** 438–440, etc.], and its potential danger as a pest noted. It is shown that 85 per cent. extraction flour leads to about double the fecundity found on 60 or 75 per cent. extraction flour. The pre-oviposition period is shown to be affected by both larval and adult food. Unfertilised females lay eggs, but these are relatively few in number, and are all sterile. Oviposition appears to be stimulated when males associate with unfertilised females, and also when they are removed from fertilised females ; the presence of five males seems to lead to greater oviposition than when only one male is present, but the use of small numbers makes these conclusions rather insecure. Although copulation occurs at frequent intervals, females will lay viable eggs for as long as 250 days after the removal of the male. Fertility [viability of the eggs laid] remains virtually constant throughout life when males are present, and is not increased by the presence of more than one male. Fertility varies inversely with the number of eggs laid. The oviposition period is long [*cf. loc. cit.*] and the average curve has a characteristic form, despite considerable daily and individual fluctuations. Oviposition may continue until death or may end some weeks before. Poor conditions tend to lengthen both the oviposition period and the length of life, the latter being greater for males than for females.

Alexander (P.), Kitchener (J. A.) & Briscoe (H. V. A.). **Inert Dust Insecticides. Part I. Mechanism of Action.**—*Ann. appl. Biol.* **31** no. 2 pp. 143–149, 2 figs., 17 refs. London, 1944. **Part II. The Nature of effective Dusts.**—*T.c.* pp. 150–156, 13 refs. **Part III. The Effect of Dusts on stored Products Pests other than** *Calandra granaria*.—*T.c.* pp. 156–159, 1 fig., 5 refs.

Most of the results of the experiments on the value and mode of action of inert dusts in controlling insect pests of stored products that are described in these papers, together with the conclusions drawn from them, have already been noticed from another source [*R.A.E.*, A **32** 38–40]. The first paper deals with the experimental methods employed, the evidence that the action of effective dusts is not due to their chemical nature, the part of the insect affected by them, their effect on loss of weight (indicative of loss of water) in living and dead adults of *Calandra granaria*, L., the relation between their effectiveness and their ability to promote loss of water, and their effectiveness

at various humidities. The rate of loss of water by both dusted and undusted weevils varied inversely with the relative humidity, but dusting increased the rate of loss at all humidities.

In the second paper, the effect on the insecticidal efficiency of the dusts of particle size, hardness and the conditions under which they are prepared and the nature of the mechanism promoting loss of water are discussed. The theory that loss of water is due to capillary action set up by the dusts [**24** 342] is disproved, since the effectiveness of various materials was not correlated with their wettability. Wet-ground dusts were in general more effective than dry-ground ones ; their effectiveness was reduced if they were subjected to dry grinding, but remained superior to that of dry-ground dusts unless the process was continued for some time. The effectiveness of some precipitated dusts was reduced by dry-grinding, but that of others was not.

In the third paper are given the results of tests of eight dusts against a number of other pests of stored products [**32** 40] and of the loss of water from dusted and undusted larvae of *Tenebrio molitor*, L. Dusts with highly adsorbent properties, such as alumina [aluminium oxide], were extremely effective against the larvae of *T. molitor*, *Tribolium castaneum*, Hbst., and *Ephestia kuehniella*, Zell., whereas hard mineral dusts were not, and the adsorbent dusts were also the more effective against the adults of *T. castaneum*, *T. confusum*, Duv., and *Ptinus tectus*, Boield., whereas adsorbent and hard mineral dusts were equally effective against adults of *C. granaria* and *C. oryzae*, L., and, in limited experiments, of *Oryzaephilus surinamensis*, L. The increase in rate of water loss caused by effective dusts was far higher in the case of larvae of *Tenebrio molitor* than in that of adults of *C. granaria* ; it is suggested that this is due to the protective coating of water-resistant material [*cf.* **32** 39] being thinner in the *Tenebrio* larvae, which may also explain the greater effect on them of a highly adsorbent dust.

Kartoffelkäfer-Forschung *Leptinotarsa decemlineata* **Say.** [Investigations on the Potato Beetle.]—*Verh. 7. int. Kongr. Ent., Berlin 1938* **4** pp. 2641–2746. Weimar, 1939. [Recd. 1944.]

The papers in this section deal with various aspects of the problem of *Leptinotarsa decemlineata*, Say, on potato in Europe and one of them has already been noticed [*R.A.E.*, A **23** 296]. Others include : **Die Technik der Kartoffelkäferbekämpfung in Deutschland** [The Technique of Potato-beetle Control in Germany], pp. 2643–2648, by R. Abraham [*cf.* **26** 418] ; **Les ennemis naturels du doryphore en Europe,** pp. 2660–2662, 7 refs., by J. Feytaud [*cf.* **26** 594 ; **23** 445 ; **29** 70] ; **L'Organisation et les travaux du Comité International pour l'Étude en commun de la Lutte contre le Doryphore,** pp. 2685–2689, by R. Mayné [*cf.* **25** 649 ; **23** 448] ; **Aperçu sur la question du doryphore en Belgique,** pp. 2695–2700, 1 ref., by G. A. Peeters [*cf.* **23** 296] ; **Die Entwicklung der Kartoffelkäfer-Frage in den Niederlanden** [The Development of the Potato-beetle Situation in Holland], pp. 2701–2703, by N. van Poeteren [*cf.* **23** 456] ; **Que faut-il entendre par foyer du doryphore ? Dénombrement des foyers,** pp. 2703–2704, by R. Mayné [*cf.* **27** 107] ; **Die Entwicklung und der gegenwärtige Stand der Kartoffelkäferfrage in Deutschland** [The Development and present Status of the Potato-beetle Situation in Germany], pp. 2705–2715, in which M. Schwartz reviews the spread of the beetle in Germany and the neighbouring countries since 1936 [*cf.* **26** 719, etc.] ; **Ueber die von mir durchgeführten Arbeiten bei der französisch-deutschen Feldstation in Ahun 1938** [On my Work at the Franco-German Field Station at Ahun in 1938], pp. 2716–2725, by K. Sellke [*cf.* **23** 449] ; **Die Organisation des deutschen Kartoffelkäfer-Abwehrdienstes** [The Organisation of the German Protection Service against the Potato Beetle], pp. 2742–2744, by H. E. Vollert ; **Bericht über die Kartoffelkäferinvasion in der Schweiz im Jahre 1938** [Report on the Invasion of Switzerland by the

Potato Beetle in 1938], pp. 2745–2746, by F. T. Wahlen [*cf.* **27** 350] ; **Vue d'ensemble sur la question doryphorique,** pp. 2650–2654, in which J. Feytaud gives a brief survey of the history of the introduction and spread of *L. decemlineata* in Europe [*cf.* **27** 583] ; and **Le rôle des facteurs naturels dans la dissémination du doryphore en Europe,** pp. 2655-2659, in which the same author concludes that its spread is chiefly due to flight, with or without the assistance of wind [*cf.* **28** 449].

In **Notes écologiques sur le doryphore et éléments pour les pronostics d'invasion qu'elles permettent,** pp. 2663–2668, 1 graph, 3 refs., P. Grison gives an account of field observations on the bionomics of the beetle carried out in 1933–36 at Ahun in the valley of the Creuse to obtain evidence of the probable cause of attack in any area having a similar climate. Potatoes are planted in late April, and the normal mean temperature is regularly over 10°C. [50°F.] in early May and 18–20°C. [64·4–68°F.] in early June. Thunderstorms are frequent in summer and are followed by a considerable drop in temperature. Oviposition begins about the end of May if the weather is fine, and is at its height in June [*cf.* **24** 573]. It diminishes in July, but continues throughout August. The length of the oviposition period is due to protracted egg-laying by certain females, some of which were observed to oviposit for as long as two months, to temporary reductions in oviposition following periods of cool weather and to delayed emergence of individual beetles, some of which remained in the soil until early July. Moreover, about 5 per cent. of the beetles re-enter the soil to aestivate in June and July and re-appear and resume oviposition at the end of July or in August. It thus appears that eggs found at any time during the summer have been laid by overwintered females, and that the beetle has only one generation a year at Ahun, a view supported by cage experiments in which no eggs were laid by paired or unpaired females that had not hibernated. The new adults emerge in numbers in early August, feed intensively for about eight days, and then migrate by crawling or flying if the weather is favourable, or re-enter the soil for hibernation if it is not. It is concluded that the second generation would be absent or negligible in any part of Europe with a climate similar to, or more rigid than, that of Ahun, and that there would be two periods of severe damage to potato, the first in early summer, when the larvae are abundant, and the second when the new adults are feeding.

In **Die Bekämpfung des Kartoffelkäfers im Grossherzogtum Luxemburg während des Jahres 1938** [The Control of the Potato Beetle in Luxemburg during 1938], pp. 2669–2674, which is a report by the Commission for the Promotion of Agriculture, Luxemburg, it is stated that infestation of potatoes by *L. decemlineata* spread over the whole country in 1938 and was supplemented by beetles migrating from Belgium, France and Germany. Owing to favourable weather, a second generation was produced. Control was carried out on the lines recommended by the International Committee [*cf.* **26** 418, 467]. The fields that were infested, or likely to become so, were sprayed with a 1 per cent. suspension of lead arsenate at the rate of 70–90 gals. per acre, and co-operative control prevented any severe damage.

In **Kartoffelkäfer-Bekämpfungsversuche mit Kalkstickstoff** [Experiments in the Control of the Potato Beetle with Calcium Cyanamide], pp. 2675–2684, 1 ref., W. Makkus describes experiments carried out in 1938 in continuation of previous ones [**27** 158 ; *cf.* also **27** 349] in two districts in France in which the soil consists chiefly of clay and sand. In tests with beetles in pots of soil treated with calcium cyanamide at rates equivalent to from 90 to 3,240 lb. per acre, ground calcium cyanamide without oil proved to be the most effective. Mortality of the beetles was high in all pots of treated soil and low in controls, but showed no evident relation to the concentration of calcium cyanamide. In experiments in a field of winter wheat in which potatoes had been grown the year before, calcium cyanamide at rates of 90 and 180 lb. per acre reduced the emergence of the overwintered adults much more than did sulphate of ammonia

at the rate of 90 lb. Oiled calcium cyanamide scattered between the rows of potato plants in the second half of May at the rate of 180 lb. per acre markedly repelled the beetles for about ten days. Other experiments confirmed the value of calcium cyanamide as a dust against the larvae [**27** 159] ; scorching of the potato plants occurred in this and other experiments, but is not considered harmful enough to prevent the treatment.

In **Les phénomènes de résistance naturelle des plantes aux attaques des insectes et essai de leur utilisation pour la lutte contre le doryphore,** pp. 2726–2730, 1 ref., B. TROUVELOT gives lists of species of *Solanum* that are highly resistant, moderately resistant and susceptible to infestation by *L. decemlineata*, and describes the ways in which larvae and adults are affected by feeding on the highly resistant *S. demissum* ; and in **Étude sur la valeur alimentaire, pour les larves du doryphore, d'hybrides** *S. demissum* × *S. tuberosum*, pp. 2731–2741, 1 fig., 3 graphs, 1 ref., TROUVELOT and [H.] MÜLLER-BÖHME record the results of laboratory observations on the feeding and development of larvae on potato, *S. demissum* and hybrids obtained from them [*cf.* **27** 357 ; **28** 446].

ARNOLDI (K. V.). **On the Conditions and Phases of the Spring Transition of *Eurygaster integriceps* to active Life as observed in south-western Uzbekistan.** —*C. R. Acad. Sci. URSS* (N.S.) **40** no. 1 pp. 35–37. Moscow, 1943. [Recd. 1945.]

The resumption of activity after hibernation by adults of *Eurygaster integriceps*, Put., was investigated in 1941–42 in the basin of the Kashka-Dar'ya, in south-western Uzbekistan, where these bugs overwinter at altitudes ranging from about 1,600 to nearly 10,000 ft. [*cf. R.A.E.*, A **32** 103], but principally at the higher altitudes. The resumption of activity, in which the author recognises three phases, commenced when the mean temperature was established at about 6°C. [42·8°F.] and was complete at about 14·5°C. [58·1°F.] ; it extended over 70 days in the area as a whole because the dates when these temperatures were reached varied with altitude. The developmental stages of common plants that can be used as phenological indices for each phase are given in a table. The bearing of these observations on control measures, which include loosening the surface of the soil, local irrigation, and running poultry over the infested areas, is briefly discussed.

KOSMACHEVSKY (A. S.). **Ecology and Distribution Areas of some Scarabaeidae Species.**—*C. R. Acad. Sci. URSS* (N.S.) **40** no. 1 pp. 38–40, 3 refs. Moscow, 1943. [Recd. 1945.]

Laboratory and field experiments to determine the effect of temperature on the development of Melolonthid larvae of five species, notably *Melolontha melolontha*, L., and *M. hippocastani*, F., were carried out in several districts in the western half of European Russia and in Khirgizia. They showed that differences in the rate of development in different regions are determined by soil temperatures, and they explained earlier observations that four years are needed for the life-cycle of *M. hippocastani* in the south and five in the north [*cf. R.A.E.*, A **25** 137].

The south-western part of the range of *M. hippocastani* (west of a line joining Pskov and Kharkov) overlaps that of *M. melolontha*, which occurs over central and southern Europe, including the western and southern part of European Russia. In an attempt to discover the factors inhibiting the eastward extension of the latter, a comparative study was made of the ecology of both species. It was concluded that *M. melolontha* requires more warmth in all stages and that its eastward spread is mainly prevented by the inability of the larvae, which do not burrow so deeply in the soil for hibernation, to survive the low winter temperatures [*cf.* **25** 141].

Kosmachevsky (A. S.). *Melolontha* **Larvae as affected by Soil Humidity.**—*C. R. Acad. Sci. URSS* (N.S.) **40** no. 6 pp. 248–250. Moscow, 1943. [Recd. 1945.]

Experiments with species of *Melolontha* and allied genera that occur in Russia showed that neither eggs nor larvae can develop in dry soil or in soil that is so wet that they cannot obtain air. The eggs require contact moisture, and the absorption of moisture approximately trebles their weight in the course of their development. The larvae require a degree of moisture that saturates the air, and they could develop when confined with roots at this humidity in the absence of soil. They are less abundant in clayey soils, in which the air supply is poor and in which they cannot move easily, than in sandy soils.

Sukhov (K. S.). **Salivary Secret[ion] of the Aphis** *Myzus persicae* **Sulz. and its Ability to form a filtering Apparatus.**—*C. R. Acad. Sci. URSS* (N.S.) **42** no. 5 pp. 226–228, 1 fig., 7 refs. Moscow, 1944.

An account is given of the technique and results of an investigation of the manner in which *Myzus persicae*, Sulz., feeds, carried out to ascertain how it inoculates vegetable tissues with a virus. It was found that the stylet penetrates gradually into and through the plant cells and emits a drop of thin colourless secretion with each penetrating movement. This fluid coagulates at once, so that, throughout the process of sucking, the stylet, including its point, is enveloped in, and moves inside, a transparent sheath. Any solution that the Aphid receives in the act of sucking is thus filtered through the sheath. Tests of its permeability showed that bacteria cannot pass through it. It appears, therefore, that the Aphid ingests vegetable sap in a filtered state without any solid particles that might obstruct the narrow sucking canal. Moreover, the viscous proteinous gel of which the sheath is formed [*cf. R.A.E.*, A **28** 300] apparently adsorbs, and thus impedes the diffusion of, a number of substances, probably including some viruses, which may explain why *M. persicae* cannot transmit the virus [*Marmor tabaci* of Holmes] that causes tobacco mosaic [**17** 282; but *cf.* **23** 346]. This suggestion was supported by an observation showing that, when the Aphids were feeding on leaves of tobacco plants infected with mosaic, the insertion of the stylet into cells containing virus inclusions did not induce the dissolution of the infective Iwanowsky crystals.

Papers noticed by Title only.

Huffaker (C. B.). **The Temperature Relations of the immature Stages of the malarial Mosquito,** *Anopheles quadrimaculatus* **Say, with a Comparison of the developmental Power of constant and variable Temperatures in Insect Metabolism.**—*Ann. ent. Soc. Amer.* **37** no. 1 pp. 1–27, 2 figs., 44 refs. Columbus, Ohio, 1944. [*Cf. R.A.E.*, B **33** 81.]

Lillie (R. D.) & Smith (M. I.). **Pathology of experimental Poisoning in Cats, Rabbits, and Rats with 2, 2 bis-parachlorphenyl-1, 1, 1 trichlorethane.**—*Publ. Hlth Rep.* **59** no. 30 pp. 979–984, 4 refs. Washington, D.C., 1944.

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